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INDEX

THE ILLUMINATING ENGINEER

LIGHT
LAMPS
FITTINGS
AND
ILLUMINATION

THE JOURNAL OF
GOOD LIGHTING

OIL
GAS
ELECTRICITY
ACETYLENE
PETROL-AIR
GAS
ETC.

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The Lighting of Churches and Cathedrals

THE series of contributions presented by Mr. Wheat, Mr. Howard Robertson, Mr. E. Stroud and Mr. Ackerley at the last meeting of the Illuminating Engineering Society, on February 19th, were marked by some very pleasant illustrations of the lighting of churches and cathedrals. They were also interesting for the attempt to crystallize experience on this subject and formulate general principles.

We are most of us agreed on certain fundamental rules—that there should be sufficient illumination to meet the requirements of the service, that there should be adequate light for the preacher, and that there should be no distracting and unduly bright sources of light visible to the congregation. These fundamental ideas were expressed in the written contribution from Mr. J. Darch, who had previously read a paper on church lighting before the Society in 1920. He, indeed, deprecating the use of costly and elaborate lighting equipment, seemed to prefer that light-sources and fittings should be invariably completely concealed from view. This idea was exemplified in many excellent views of concealed lighting shown at the meeting; yet instances in which the lighting fittings are themselves intended to play a definite part in the general design were shown by Mr. Howard Robertson. In some churches the use of light in this way is traditional.

Several of the authors were inclined to complain of the diversity of view held by church authorities, and of the apparently obstinate preference for antiquated methods of illumination exhibited by some. Differences in viewpoint, one fears, will always be encountered. Naturally the ideas of those associated with different forms of worship will vary, but even those of the same sect or denomination reveal surprising differences in opinion. In some cases objections to advances arise from imperfect visualizing of what is proposed; a visit to a cathedral lighted according to modern ideas will usually smooth these objections away. Fears of undue theatrical effect can usually be exorcised by the same method. The disposition to prefer unduly subdued lighting in churches is gradually giving way to a recognition that, after all, artificial lighting should do what natural light through coloured-glass windows rarely effects—that is, enable all architectural features that delight the eye to emerge from obscurity.

Higher Candle-power Lamps and Miners' Nystagmus

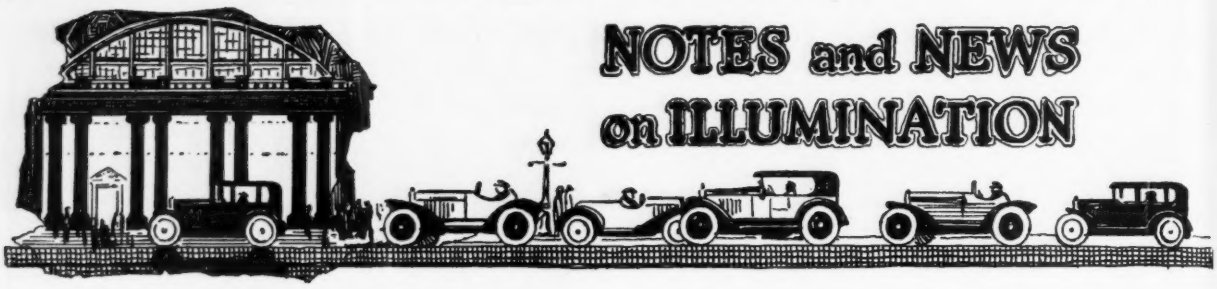
AT a recent meeting of the Midland Institute of Mining Engineers, in Leeds,* Dr. W. J. Wellwood Ferguson gave an account of some researches with higher candle-power miners' lamps now in progress. The main object was to ascertain the benefit of such lamps in diminishing miner's nystagmus. Promising results had already been obtained. A shift of 40 men at Tinsley Park Colliery had been equipped with 2.5 and 3.5 candle-power lamps, and were examined at intervals, a "control" shift having lamps of the ordinary pattern being studied simultaneously. Of the five original cases of nystagmus in the shift equipped with the high candle-power lamps none had now any symptoms of nystagmus, either objective (oscillations) or subjective (neuroses). On the other hand, one new case had developed in the "control" shift.

A similar experiment had been commenced at the Nunnery Colliery, flame lamps of $2\frac{1}{4}$ candle-power being here used by one shift, and a control shift again equipped with ordinary lamps. At the end of eight months two of the seven cases in the shift equipped with the high candle-power lamp were free from oscillations, and two more showed marked improvement. All seven were free from subjective symptoms. In the control shift at the end of the same period none of the cases of nystagmus has improved, and two fresh cases had developed.

In the course of the discussion Mr. J. Ensor (Tinsley Park Colliery) remarked that the men seemed happier with the high candle-power lamps and the coal came out cleaner. The only apparent drawback was the greater weight, to which the men became accustomed after a few days. The extra light should prove of great advantage, both to the miner and the mine-owner.

Even if one accepts with some caution the conclusion drawn by some speakers at the conference that an increase from one to two and a half candle-power was sufficient to "wipe out nystagmus," there seems little doubt of the benefit derived from this relatively small advance. We imagine, however, that with still higher candle-powers even greater benefit would be obtained. The lighting of mines is, in fact, a case where we are very far indeed from the "saturation point," the standard (even taking into consideration such advances as those mentioned above) being far below that considered necessary in other forms of industry.

* *Sheffield Daily Telegraph*, January 16th, 1932.



The Illuminating Engineering Society

FORTHCOMING MEETINGS.

The next meeting of the Illuminating Engineering Society (to be held in the House of the Royal Society of Arts, on March 18th) is to be devoted to a paper by Mr. F. E. Rowland on "The Application of Electric Light to Agriculture." This should give rise to an interesting discussion.

The Society is following up its usual plan of arranging special meetings away from London, and two forthcoming gatherings, in Manchester and Birmingham, have recently been announced. At the meeting in Manchester, which is to take place in the Manchester College of Technology on the evening of March 10th, Mr. C. C. Paterson will give an address on the International Illumination Congress. At the Birmingham meeting, which is being held in the Assembly Room of the Chamber of Commerce on March 14th, there will be two addresses. Mr. Spencer Johns will speak on "The Importance of Good Lighting in Commerce and Industry," and Mr. F. E. Shopland, one of H.M. Inspectors of Factories, will present "Some Observations on Lighting in Factories."

We hope very much that a good number of members will make a point of travelling up from London to attend these two gatherings in Manchester and Birmingham, where, it is hoped, local centres of the Society will ultimately be formed. In Manchester, we understand, considerable progress in this direction has already been made, and the formation of a local centre is by no means a distant prospect.

The Association of Public Lighting Engineers

ANNUAL CONFERENCE AND EXHIBITION.

Readers will recall that the Association has accepted an invitation from the Blackpool Corporation to hold its ninth annual conference in Blackpool in September next. A number of interesting papers, in which the administration of public lighting departments and the requirements of towns of small and moderate size will be dealt with, is in course of preparation, and the customary Exhibition of Public Lamps and Lighting Equipment promises this year to be of more than ordinary interest. The headquarters of the conference will be at the Imperial Hotel, where it is proposed that the exhibition should also take place. The proceedings will include a civic luncheon, and the exhibition will be officially opened on the evening of Monday, September 5th, the conference terminating by Thursday, September 8th, an arrangement which will enable visitors to take advantage of opportunities to visit the Isle of Man and other places of interest in the vicinity of Blackpool. Particulars, we understand, will be circulated very shortly.

We may also draw attention to the session on Public Lighting which is being arranged in conjunction with the annual conference of the National Safety First Association on May 5th (see p. 76).

The International Illumination Congress

APPRECIATION IN GERMANY.

Dr. W. Wissmann's account of the International Illumination Congress, presented at the annual meeting of the German Illuminating Engineering Society last year, and recently published in *Licht und Lampe*, contains a generous tribute to the excellence of the organization and the care with which every detail was planned in advance. It is the general feeling that this was due in no small measure to the skilful staff work of the Hon. General Secretary (Col. C. H. Silvester Evans). Dr. Wissmann, however, also makes a pertinent criticism when he comments on the ever-growing mass of papers presented at the International Congresses, which allows no time for adequate discussion. This is an old problem with which future congresses will undoubtedly have to grapple seriously. There is a natural feeling on the part of all the participating countries to be well represented on the list of authors, and up to a point this is a good thing. One cannot escape the feeling, however, that this is liable to result in a mass of rather mediocre contributions, which prevents proper consideration being given to the more meritorious ones. The remedy is not so clear. Possibly the Papers Committee might "star" certain papers for presentation and discussion, the majority by general consent being merely formally presented. We have indeed already gone a certain distance in this direction, but the fuller adoption of this policy would clearly bring with it somewhat delicate problems.

Retirement of Mr. Robert Mason

With the retirement of Mr. Robert Mason, under the age-limit, as Public Lighting Superintendent of the city of Birmingham, the Association of Public Lighting Engineers loses a "foundation" member who, until recently, had been a member of the Association Council from its inception. Founded at a meeting in Birmingham in September, 1923, Mr. Mason took more than a casual interest in the Association, and at once joined the Council, and on several occasions granted facilities for meetings of the Council in his Department. He was offered the office of the Presidency some three years ago, but his approaching retirement and indifferent health caused him to refuse the honour.

Mr. Mason had an association of nearly fifty years with the Lighting Department of the city of Birmingham, having joined the staff as clerk in 1883, and was appointed chief clerk in 1895. He contributed much to the efficient public lighting of his city and to public lighting generally by his continuous experiments with burners and lamps. On his farewell he was the recipient of a presentation from the staff and employees of the department.

We are sure that all members of the Association of Public Lighting Engineers will join us in wishing Mr. Mason many happy years of well-earned leisure.

TECHNICAL SECTION

COMPRISING

Transactions of The Illuminating Engineering Society and Special Articles

The Illuminating Engineering Society is not, as a body, responsible for the opinions expressed by individual authors or speakers.

The Lighting of Churches and Cathedrals

(Proceedings at a Meeting of the Illuminating Engineering Society, held at the House of the Royal Society of Arts, 18, John Street, Adelphi, London, W.C., at 6-45 p.m., on Friday, February 19th.)

A MEETING of the Society was held in the House of the Royal Society of Arts, 18, John Street, Adelphi, London, W.C., at 6-30 p.m., on Friday, February 19th. After the usual introductory period devoted to conversation and light refreshments the meeting commenced at 7 p.m. In the absence of the President the chair was taken by Lt.-Col. Haydn T. Harrison (Vice-President).

After the minutes of the last meeting had been taken as read, the Hon. Secretary read out the names of applicants for membership, which were as follows:—

Sustaining Members:—

Croydon Corporation Electricity Department. (*Representative*: Mr. F. N. Randell Baker, Electric House, 32, High Street, Croydon.)

Watford Corporation Electricity Department. (*Representative*: Mr. A. W. Barham, Electricity Works, Cardiff Road, Watford.)

Westminster Electric Supply Corporation Ltd. (*Representative*: Mr. M. E. Pyser, 6, Eccleston Place, Westminster, S.W.1.)

Corporate Members:—

Abbott, F. .....Representative of The General Electric Co. Ltd., 31, Wyngate Road, Cheadle Hulme, Cheshire.

Adams, F. D. .....Representative of The General Electric Co. Ltd., 55, Swann Lane, Cheadle Hulme, Cheshire.

Dickinson, S. .....Electrical Engineer, 104, Oldham Road, Manchester.

Fisher, W. M. .....Manager, Lamp Department, G.E.C., 6, Kearsley Road, Higher Crumpsall, Manchester.

Le Fevre, R. N. .....Gas Light & Coke Co. Research and Training Section, 29, Marlborough Road, Richmond, Surrey.

Milne, F. T. .....Lighting Department, General Electric Co. (India) Ltd., Calcutta.

Sellars, J. .....Public Lighting Superintendent, City Engineer's Department, Town Hall, Manchester.

Weit, W. .....Assistant, Research Laboratories of the General Electric Co. Ltd., Tower House, Ridgeway, Enfield.

Country and Foreign Members:—

Carrigg, T. B. .....Electrical Engineer, 58, Grove Park, Rathmines, Dublin.

Barnes, W. A. .....Electrical Engineer, "Braemar," Glebelands Road East, Prestwich, Manchester.

Bowser, Mrs. B. .....Editor and Merchandising Consultant, 51, Madison Avenue, New York City, U.S.A.

Caldwell, Prof. F. C....Ohio State University, Colombus, Ohio, U.S.A.

Dumont, J. .....Compagnie d'Electricite de l'Ouest Parisien, 3 Par Quai National, Puteaux (Seine), France.

Koch, H. .....Manager, Lighting Bureau, Osram Oesterreichische Glühlampenfabrik Gesellschaft, Vienna.

The Hon. Secretary then read again the names of applicants presented at the previous meeting, and these gentlemen were formally declared members of the Society.*

Contributions, illustrated by numerous attractive lantern slides, and dealing with various phases of church and cathedral lighting, were then presented by Mr. H. C. WHEAT, Mr. HOWARD ROBERTSON, Mr. E. STROUD, Mr. R. O. ACKERLEY, and Mr. F. J. GOULD. Written contributions from Mr. J. DARCH (who had delivered a paper on church lighting before the Society some years ago) and from Mr. H. PASSMORE, who is associated with the firm of architects acting for the Ecclesiastical Commissioners, were presented in abstract by the Hon Secretary.

An interesting discussion ensued, in which the CHAIRMAN (Lt.-Col. HAYDN T. HARRISON), Mr. J. HICKS, Mr. L. M. TYE, Mr. A. BLOK, Mr. A. W. BEUTTELL, Mr. P. S. BARTON and Mr. HOWARD ROBERTSON took part. After Mr. Wheat had made a brief reply to the discussion, a cordial vote of thanks to the authors was proposed by the Chairman, and was carried with acclamation.

In conclusion, the Hon. Secretary referred to the next meeting in London, on March 18th, when Mr. F. E. ROWLAND would present a paper on "Electric Light in Agriculture," and to the forthcoming special meetings in Manchester and Birmingham (particulars of which are given on p. 62), which he hoped London members would make a special effort to attend.

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* *The Illuminating Engineer, February*, 1932, *p.* 31.

Illuminating Engineering Society

(Founded in London, 1909; Incorporated 1930).

Election of Officers and Council Session 1930-1931

OFFICIAL NOTICE

IN accordance with the procedure specified in the Articles of the Society, a list of existing Officers and Members of Council, of vacancies occurring and of duly qualified persons nominated by the Council for vacancies about to occur in the offices of President, Vice-Presidents, Hon. Treasurer, Hon. Secretary, and Ordinary Members of Council, is enclosed herewith for the information of the Members of the Society.

In the event of any Members desiring to put forward other names, the Council will be pleased to receive such nominations, which should be made in accordance with the following rule (Article 48):—

> "After the issue of the Council's list, and not later than the *15th day of April* next following, any ten Members (but no more than ten) may nominate any other duly qualified person to fill any such vacancy by delivering such nominations in writing to the Hon. Secretary, together with the written consent of such person to accept office if elected, but each such nominator shall be debarred from nominating any other person for the same office at such election."

Present Officers and Members of Council

***President*:—*Sir Francis Goodenough*, C.B.E.**

***Past Presidents*:—**

Sir WILLIAM BENNETT, K.C.V.O., F.R.C.S.
Mr. A. P. TROTTER
Sir JOHN HERBERT PARSONS, C.B.E., F.R.S.
Mr. D. R. WILSON, C.B.E.
Mr. C. C. PATERSON, O.B.E., M.I.E.E.
Dr. J. W. T. WALSH, M.A., D.SC., M.I.E.E.
Lt.-Col. K. EDGCUMBE, T.D., M.INST.C.E., M.I.E.E.

***Vice-Presidents*:—**

Lt.-Commander Haydn T. Harrison (1929)
Mr. C. W. SULLY (1930)
Mr. H. HEPWORTH THOMPSON (1931)

***Members of Council*:—**

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Mr. L. E. BUCKELL (1930)
Mr. H. BUCKLEY (1930)
Mr. G. Campbell (1929)
Mr. J. ECK (1931)
Dr. S. ENGLISH (1930)
Mr. P. Good (1929)
Mr. S. B. LANGLANDS (1931)
Capt. W. J. LIBERTY (1931)
Mr. J. Macintyre (1929)
Mr. W. MILLNER (1931)
Mr. E. L. Oughton (1929)
Mr. F. W. PURSE (1930)
Mr. HOWARD ROBERTSON (1931)
Mr. JOHN TERRACE (1930)
Lt.-Col. W. A. Vignoles (1929)
Mr. J. C. WALKER (1931)
Mr. H. C. WHEAT (1931)
Mr. H. T. YOUNG (1929)

***Hon Secretary*:—*Mr. J. Stewart Dow* (1928)**

***Hon. Treasurer*:—*Mr. J. Wyatt Ife* (1909)**

Nominated by the Council to fill Vacancies

***President*:—**

LT.-COMMANDER HAYDN T. HARRISON

***Vice-Presidents*:—**

Mr. A. W. BEUTTELL

***Members of Council*:—**

Mr. A. CUNNINGTON
Mr. R. S. DOWNE
COL. C. H. SILVESTER EVANS
Mr. C. HUGHES
Mr. W. J. JONES
Mr. C. A. MASTERMAN

***Hon. Secretary*:—**Mr. J. STEWART DOW

***Hon. Treasurer*:—**Mr. J. WYATT IFE

The names in italics are those of retiring Officers or Members. The date in parentheses after each name indicates the date of election to Office or Membership of the Council.

Some Notes on the Lighting of Cathedrals

By H. C. WHEAT

(Abstract of an Address delivered at the Meeting of the Illuminating Engineering Society, held in the House of the Royal Society of Arts, 18, John Street, Adelphi, London, W.C., at 6-45 p.m., on Friday, February 19th, 1932.)

THE writer was originally invited to deal with cathedral lighting, but it was subsequently suggested that a few general introductory remarks on church lighting might be welcome.

An illuminating engineer should undoubtedly be versatile, and should have some knowledge of kindred matters, such as electricity (or gas), supply and distribution, eyesight, manufacturing processes, architecture, etc. If this is true in general, it is particularly so in in the case of church lighting, where it is necessary to consider so many different people's requirements; as, for instance, where the architect will not allow anything to be fixed in the walls or roof (vaulting), or the clergy are terrified of anything theatrical (I remember having to give a written statement in one case that the proposed lighting equipment was not used in theatres); not to mention those numerous situations where individuals hold views that have to be met or reconciled. Each denomination has its own particular idiosyncrasies, and in many cases these vary according to the particular views held at any one church. Thus the type of service has a distinct bearing on the lighting that is acceptable.

The differences in types of building, from the architectural standpoint, also call for varying treatment. A scheme that is successful in one may be absolutely impracticable in another, even without considering its suitability. The question of accessibility of the lighting units for maintenance is one the importance of which, though often ignored, cannot be too strongly emphasized. Convenience and flexibility of control are matters that deserve more attention than they usually receive, and with this, of course, the characteristics and positions of the lighting units are involved. In come cases the fact that there are comparatively dark areas between the lighting units at "half light" is immaterial; in others it is very desirable that the evenness of the illumination should not be affected, but only its level.

One not infrequently hears the use of candles for lighting old buildings advocated on the ground that they are much more in keeping with the period of the building, but surely candles have no more justification in, say, a Norman church than any of the more modern illuminants on this count! The lighting effect is certainly not comparable, and why should convenience, eyesight and hygiene be neglected for purely sentimental reasons? The fact that electricity permits us to produce lighting effects that have not hitherto been possible is surely no argument against its employment, or for restricting its application to forms to which early illuminants were limited. Presumably we are all agreed that certain forms of daylight are ideal, and therefore the nearer we can emulate its virtues and eliminate its vices the better for everyone.

Let us now turn to the chief subject of my address, namely, the *Lighting of Cathedrals*.

In presenting the following notes on this subject, an endeavour is made to bring out some of the features of interest in connection with installations that have actually been made, in the hope of anticipating points that may be raised in discussion, rather than to attempt to lay down theoretical principles which should form the correct method of approach to such problems. It is assumed that members of this Society are at any rate familiar with the fundamentals of good lighting. (Would that the same could be said of all the various people who have a say in these matters!)

FIG 1.—A Daylight View across Peterborough Cathedral.

Since Peterborough was a pioneer installation, no need is felt for an apology in devoting some time to it, although, as it was completed six years ago, it can scarcely be considered novel now. As you are probably aware, the interior is almost wholly Norman and symmetrical; the nave, transepts and choir each comprise main arcade, triforium and clerestory; although vaulting columns are included in the walls the roof is of timber, with decorated panelling, since the builders did not have the courage to carry out the vaulting which was originally intended. It was first suggested to place the lighting units in the triforium, but on investigation it was found that the clerestory not only would give a better mounting height but would afford more concealment for the units—two being employed per bay, one on each side of the central arch, i.e., on each side of the window. Not only does this enable the light to come from a similar position as daylight, but the units are in shadow during the daytime, and not easy to locate against the light coming through the window. It is desirable to here emphasize the fact that the idea underlying this system of lighting is the concealment of the unit—criticism is often levelled against the appearance of the unit—which in itself is true—that they are ugly, but they are not intended to be seen from normal viewpoints. No units are visible at Peterborough when the building is viewed along its length—the normal way. They can be seen when viewed across the building, principally owing to the daylight reflections in the reflector—later units have been considerably improved in this respect.

Now, while the main beam from the units is trained diagonally downward and across the building toward the base of the arcading on the opposite side, giving the highest level of illumination at the lower part of the building, the whole of the walls and roof are illuminated, though at a somewhat lower level. The general effect resembles that of sunlight, and is to most people exhilarating.

(Mr. Wheat then exhibited several slides showing a cross-section of Peterborough Cathedral, illustrating the positions of the units in detail and (1) how, when correctly trained, part of the beam is lost on the sill or the clerestory; (2) how this part of the light is deflected upward and across the building to light the upper part of the opposite side.

A further slide (Fig. 1) displayed a daylight view across the cathedral, showing the disposition of the units on each side of the window. This was taken primarily with the idea of showing how inconspicuous the units are by day, even when in the line of sight.

Other slides showed the nave looking east by artificial light (Fig. 2), and the whole cathedral by artificial light, viewed from the triforium level behind the high altar (Fig. 3).

Yet another slide showed the light in the south aisle, which is spilled over from the nave, i.e., there are no lighting units in the aisles.)

Durham Cathedral is also mostly Norman—with main arcade, triforium and clerestory in nave, transepts and choir (the clerestory in the last case being inaccessible), but here the building is complete with stone vaulting.

Now, while the same general arrangement of units has been employed at Durham as at Peterborough, the whole of the light has been restricted to the lower portion of the building, and fades away to nothing before the arches of the main arcading are reached, leaving the roof vaulting in darkness. This, and the use of amber screens, was done to meet the views of the cathedral architect.

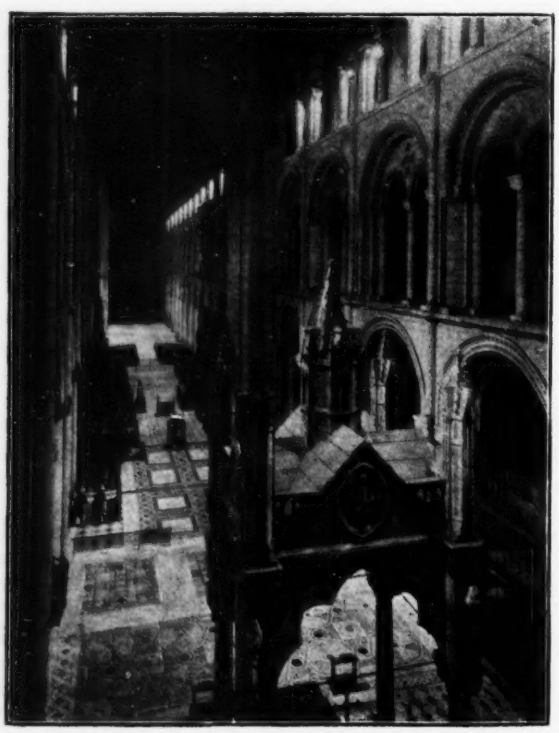


FIG. 3.—Peterborough Cathedral by artificial light.

FIG. 2.—Peterborough Cathedral Nave by artificial light.

Fig. 4 is a daylight view across Durham Cathedral, showing the lighting units in the clerestory of the nave. The photographer, in his desire to achieve his objective, had the units switched on, "as otherwise they would not have been visible."

FIG. 4.—Durham Cathedral by daylight.

Fig. 5 shows the nave by artificial light.

This illustrates the flexibility of this method of lighting, and with the latest improved form of projector, the units, when furnished to match their surroundings, are practically invisible by daylight.

In both Peterborough and Durham Cathedrals the units are controlled from push-button panels in the nave or chancel floor, operating contractor switches in the triforium or clerestory. This not only facilitates operation but saves a great deal of cabling, and avoids voltage drop.

It is interesting to note that architects appear very sharply divided in their views as to which of these lighting effects (without regard to the means employed for obtaining them) is desirable for this type of building. They have frequently criticised artificial lighting on the score that it reverses or distorts natural shadows, i.e., that it does not produce a similar effect to daylight. It is reasonable, therefore, to expect that where the artificial light comes

FIG. 5.—Durham Cathedral. View of Nave by artificial light.

from the same direction as daylight, and consequently gives very similar shadows, architects would be pleased with the results. This is the case at Peterborough, but while most people like, or are even enthusiastic, over the result, this view of lighting is not held by all architects. Thus, some of them consider that there should be an " air of mystery " about the upper part of a building, which should consequently be left unlighted, as in the case at Durham; the lighting of which, to many people, is not comparable with that of Peterborough, giving a somewhat depressing effect. It certainly does not allow the building to be seen to advantage at night in the same manner as at Peterborough.

It is difficult to reconcile the argument in favour of leaving the upper part of the building in darkness with the practice of elaborately decorating roofs or ceilings, which obviously are intended to be seen. In fact, special lighting units are frequently employed solely to illuminate them.

In the case of the Greek Cathedral of St. Sophia practically the whole of the lighting is effected by reflection from the dome, the units being concealed in the main cornice. In this particular instance there are windows in the dome, but in others, where this is not the case, the dome may frequently be the darkest portion of the building by day and the brightest at night. Fig. 6 shows a view of the dome by artificial light, and Fig. 7 the general effect of the lighting.

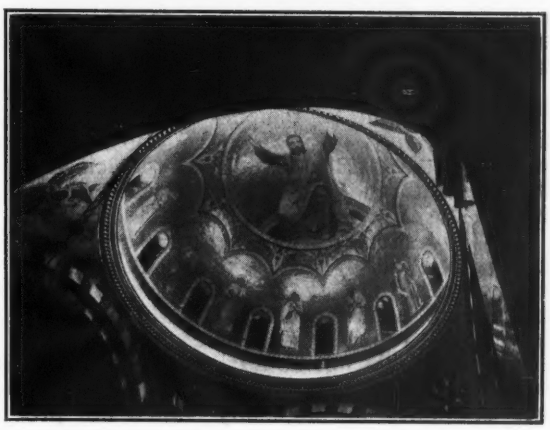


FIG. 6.—The Illuminated Dome of the Cathedral of St. Sophia.

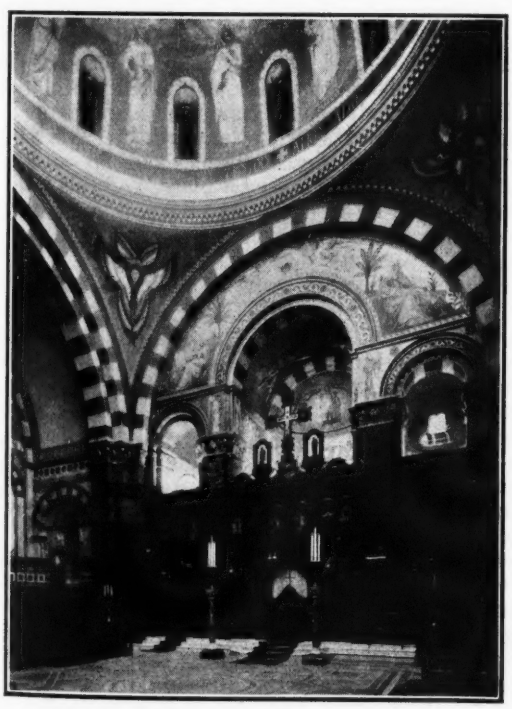


FIG. 7.—A View of the Cathedral of St. Sophia.

There appear to be a considerable number of people who think that the only proper way to light an ecclesiastical building is by means of pendants hung low, usually on long suspension from the roof. To most of us such an arrangement is about the least satisfactory both by day and night, particularly with opaque units. In daytime the units are unsightly and superfluous, and at night the height of the building appears cut off more or less abruptly at the level of the lighting units. Even supposing that the actual illumination at book level is sufficient —not by any means always the case—equally good results can be obtained without thrusting the lighting units into prominence. Apparently the only real explanation is that this had to be done in the case of the earlier illuminants, and so it has become a habit which it is hard to break.

It is not suggested that these methods of lighting represent the highest physical efficiency in terms of wattage employed relative to area of floor illuminated, although this compares favourably with many other installations, but rather that the loading is reasonable for the effect obtained. The first cost of such an installation, with remote control, however, certainly does compare favourably with the cost of an installation employing decorative fittings. Furthermore, access for cleaning and maintenance is far easier, and last, but by no means least, no tubing or wires are visible on the face of the building.

Some Notes on Church Lighting

By HOWARD ROBERTSON, F.R.I.B.A.

(Summary of Address delivered before the Meeting of the Illuminating Engineering Society, at the House of the Royal Society of Arts, 18, John Street, Adelphi, London, W.C.2, at 6-45 p.m., on Friday, February 19th, 1932.)

THERE are many types of churches, and not a few denominations; so that it is impossible to generalize in the matter of lighting.

Yet certain principles generally apply. We may assume the desire to obviate glare and eye fatigue; yet we should not overlook the decorative aspect of points of light which have a value from the standpoint of cheerfulness.

Totally indirect lighting is apt to be lugubrious, especially if it is entirely by reflection from the ceiling. Again, contrasts in lighting effects are desirable, as they are in matters of design generally. A chancel may be lit indirectly, a nave by direct or semi-indirect systems.

Lighting by floor standards is employed in a number of modern churches abroad. In my opinion, a possible solution of nave lighting is by standards with strong light upwards, and a softer light downwards, on the principle of drawing-room standard lamps designed on this system.

In respect of indirect lighting, in designing a new church, I would be tempted to experiment with lights built into troughs in the walls, at a point which, in the chancel, could be very close to the floor. If this built-in light-source is too elevated, the wall below the trough is in semi-shadow.

Lighting should, of course, be in sympathy with architectural form. And it is difficult to satisfy the æsthetic sense with floodlighting behind piers, etc., in existing Gothic churches in which it is almost impossible to conceal the source satisfactorily. The spectator should not be intrigued by, or conscious of, the source of light. Distraction is obviously not desirable, and ingenuity should not proclaim itself.

A too-theatrical element in lighting is deprecated by such bodies as the Incorporated Church Building Society, and there undoubtedly is a certain danger, with modern methods, of suggesting cinema effects.

A very interesting lighting scheme has been carried out at Aix-la-Chapelle, in the Church of Our Saviour. Here the nave lighting is by means of long cords from the lofty flat nave ceiling, on to which, at intervals, are clipped naked tubular lamps. These long delicate streamers offer not only illumination, but a series of delicate points of light. A few floor standards, lighting upwards, complete the illumination.

The principal desideratum, in my opinion, is the incorporation of the lighting effects in the design and construction of the church form. This has not been often seriously attempted, partly because of the fear of startling conservative opinion, and largely because of the dearth of new work. Alteration work must obviously be a matter of treating individual requirements; but it is an encouraging fact that students and younger members of the architectural profession are greatly interested in lighting, and the next few years will probably witness a far greater display of imagination and an increasing collaboration with the illuminating engineer.

(Mr. Howard Robertson's address was supplemented by a variety of lantern slides, illustrating lighting arrangements in Scandinavian and Continental churches. Some of the installations shown were highly original, a feature in several cases being the deliberate use of unusual and ornamental lighting equipment as part of the general architectural scheme. We hope to reproduce one or two of these views in a subsequent issue.—ED.)

The Lighting of the Church of Christ the King, Cork

By E. STROUD

(Summary of Address delivered before the Meeting of the Illuminating Engineering Society, at the House of the Royal Society of Arts, 18, John Street, Adelphi, London, W.C.2, at 6-45 p.m., on Friday, February 19th, 1932.)

THE problem which I am discussing this evening is the artificial lighting of a church of unique design. A brief description of the formation and architecture may therefore be helpful in enabling the objects of the system of artificial lighting to be understood.

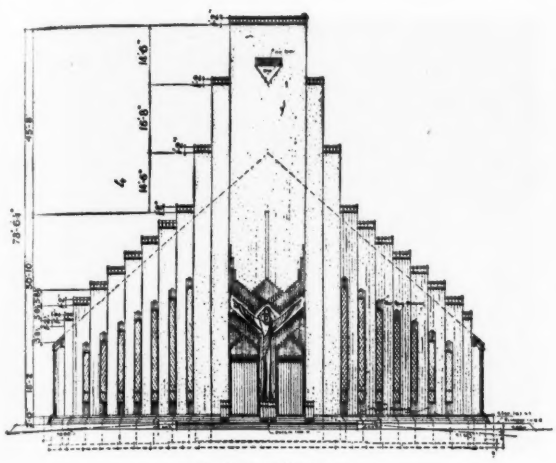
The edifice is the Roman Catholic Church of Christ the King, Cork, Ireland, the architects being Barry Bryne, of Chicago, and J. R. Boyd Barrett, of Cork. The church is of unusual shape and style, and is built of concrete. The plan of the building closely resembles an ellipse in outline, the curved portions being stepped; this form was chosen in order to allow that every person in the church should have an uninterrupted view of the altar, and because the elliptical shape is considered good from the acoustic standpoint. (This has been borne out in practice, and the acoustic properties of the church are, in fact, remarkably good.)

On the front elevation, or west end, a square tower, with a width of 19 ft., rises to a height of 100 ft. Then on each side there is a series of square columns graduating in height and receding, thus forming steps. The east end is similar in construction with the exception of the tower. At the base of the tower are the two main doors, and between the two doors is a figure of Christ in stone, with arms outstretched, forming the centre pillar. This stone relief is 23 ft. high and 28 ft. from the ground, and forms a most impressive feature of the entrance.

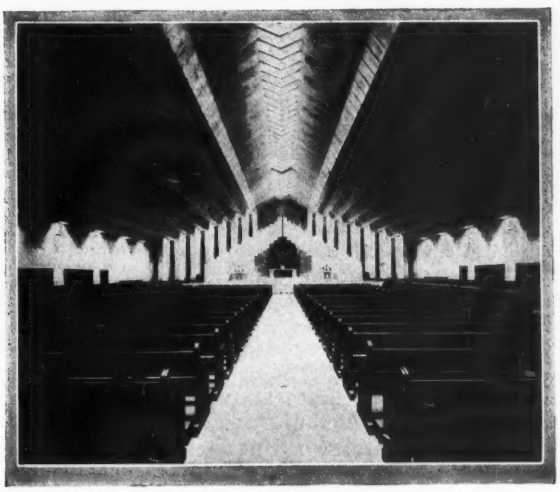
In each receding column or step is formed a long narrow window ranging from 28 ft. long on the highest column to 12 ft. in the shorter, all these windows being approximately 2 ft. in width. These windows provide the necessary daylight, except for a louvred skylight along the apex of the roof.

The length on the centre line is 150 ft. and the width 105 ft. The roof is formed in one span 67 ft. high at the apex, sloping to 20 ft. at the sides. The roof section consists of steel joists running from truss to truss, and the bottoms of these are bolted to channel irons to which expanded metal for the ceiling is wired. The ceiling is also formed of a number of steps rising to the skylight. The channel irons are cut at the skylight, and an angle iron inserted to which is bolted a plate, and this holds the glazed skylight sashes. At intervals of 2 ft. 3 ins. along the whole length of the skylight is a series of louvres projecting downwards to shield from view the direct daylight or artificial light.

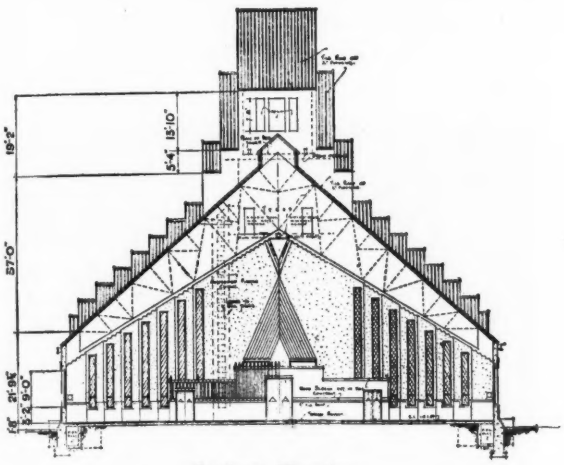
In regard to the artificial lighting, the architect, in view of the design of the church, specified that concealed lighting should be adopted and that the main lighting should be arranged behind the louvres along the roof apex. The system adopted involved the installation of 55 prismatic reflectors, each equipped with a 300-watt lamp, one unit between each louvre, which are on approximate 2 ft. 3 ins. centres. The ceiling is arranged with a centre rolled-steel joist running the length of the church. The units, therefore, were arranged on alternate sides, giving the units a staggered formation. At the same time, they were alternately angled left and right, at approximately 30° to the vertical and 20° in a forward direction, in order that there should be as little obstruction as possible from the actual louvres themselves, and also to ensure the floor-area being fully covered.



Sectional Elevation.



Interior View, taken by artificial light.



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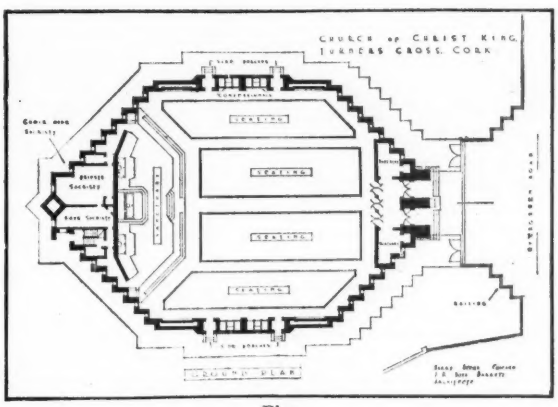


Plan.

ILLUSTRATIONS SHOWING THE CHIEF ARCHITECTURAL FEATURES AND SYSTEM OF LIGHTING OF THE CHURCH OF CHRIST THE KING, CORK, IRISH FREE STATE. (*Mr. E. Stroud*)

A further series of lighting units is arranged down the sides of the church in order to augment the main lighting and to serve the Stations of the Cross. These units again are concealed, and are let flush into the flat sections of the stepped ceiling. The ceiling construction is such that there is a gradual decrease in height at the ends towards the centre line, so that each side-light is at a varying height from the ground. This varying height was taken into consideration in determining the wattage of the lamps used. For this series of units 22 concentrating reflectors with 100-watt lamps and 20 with 150-watt lamps are installed. The altar-lighting is augmented by the installation of four reflectors with 500-watt lamps, giving an increased illumination over this area.

The lighting system was designed to give an illumination of 5 foot-candles over the main body of the church, and I am informed by Mr. Boyd Barrett, the architect, that the effect obtained is very good. The main units flood the church from the skylight, while the side-lights enable a uniform illumination to be furnished throughout the church. Owing to the method of recessing the side-lights and to the fact of them being close to the walls, a series of arched shadows are formed on the side walls with very pleasing effect.

I have to thank Mr. Boyd Barrett for the constructional details, drawing and photographs of this unique building, and trust that my short résumé will prove of interest in showing how a somewhat unusual lighting problem has been treated.

The Application of Concealed Lighting in Churches

By R. O. ACKERLEY

(*Summary of Address delivered before the Meeting of the Illuminating Engineering Society, at the House of the Royal Society of Arts, 18, John Street, Adelphi, London, W.C.2, at 6-45 p.m., on Friday, February 19th, 1932.*)

IN contributing to this discussion a few notes on " The Application of Concealed Lighting to Churches " it is not my intention to attempt to cover the technical aspects of the problem, but to deal purely with the question of the suitability of this form of lighting for churches of varying types and denominations.

It may be well to start by an explanation of what is meant by concealed lighting. In speaking of concealed lighting in churches one does not necessarily mean that the lighting fittings and the actual light-sources cannot be seen from any position in the body of the church, but that they would never be seen by any normally placed member of the congregation. Psychologically speaking, therefore, the units are invisible. They may in some cases actually be concealed, in the sense that they are completely out of sight from any part of the ground level of the church, but this is not an essential of concealed lighting of the type which we are considering.

With the aid of slides depicting typical installations in churches of all denominations and of all periods of architecture, I hope to demonstrate to

you that this form of lighting is not only applicable, but is the best form of lighting so far discovered for the great majority of churches. It must, however, be understood that concealed lighting cannot be considered as universal in its application. While the light-sources may be visible from certain positions in the church, it is essential that they should not be visible from *all* positions in the church, and obviously, therefore, where the church is built without any effective means of concealing the units, such a system cannot be carried out. While, for the purpose of concealment, a variety of architectural features can be employed, such as clerestory arches, recessed windows, overhead beams and the eastern side of the main arches, corbals and the like, in the absence of any of these features some other form of lighting must be employed.

Concealed lighting of churches has been criticized on much the same lines as the recent Congress floodlighting, the main point of criticism being that shadows are cast in the wrong directions. While not admitting the justification of the criticisms against floodlighting, there are two essential differences which operate in the case of church lighting.

Anyone who criticizes destructively a floodlighting scheme can always say that it were better that the lighting had never been installed at all. In the case of church lighting it is not necessarily the question of whether the artificial light is as good as daylight, but whether it is the best that can be obtained for the purpose, because obviously the churches must be lit in some way. Purely destructive criticism of church lighting should therefore be disregarded. Some of the slides I am showing to-night will compare the difference between the old lighting using visible light-sources and the new concealed lighting.

The second difference between floodlighting and church lighting is that, whereas under present conditions it is sometimes difficult to make the light strike the outside of a building from the same direction as the sun normally strikes it (one wonders sometimes whether critics do realize that the sun is not by any means an immovable body, but moves round the heavens and changes position according to the season of the year), in church lighting, by placing the concealed units in, for instance, the window embrasures the light can be made to create shadows very similar to those obtaining in the daytime.

It must further be remembered that in many churches large areas are frequently found over which there is no convenient fixing for suspended lighting fittings. Hence, if satisfactory illumination is to be obtained over the whole of the pew area, individual points under any direct system must necessarily have too great a surface brightness to be either pleasing or comfortable.

The slides showing some of the older installations clearly illustrate this point.

Are we not entitled to believe that had the designers of some of our beautiful old churches had at their disposal modern methods of lighting, they would have used them with more enterprise and originality than some of their present-day successors?

Are we not also entitled to believe that a man who embodies the most beautiful tracery and decoration in a roof, which for 365 days in the year is practically invisible night and day under the old regime, would not also have welcomed a means of illumination which would have allowed its beauties to have been revealed to the world?

Slides taken at random show how this method of lighting can, under reasonable conditions, be employed equally effectively in the largest cathedral or the smallest country church, the oldest and the most modern alike.

FIG. 1.—A View of the Nave, with the original system of lighting. The sources of light are exposed at a low level and the upper parts of the interior are left in obscurity.

FIG. 2.—A View of the Nave from the same aspect, but with the improved lighting now in use. No sources of light are visible, and the features of the interior can be clearly seen.

FIG. 3.—The Choir Stalls and Altar seen by the new lighting now adopted.

SOME VIEWS SHOWING THE LIGHTING OF RIPON CATHEDRAL. (*Mr. Ackerley*).

FIG. 4.—A View of St. Peter's, Ealing.

FIG. 5.—Bearsted Parish Church, Kent.

TWO ILLUSTRATIONS SHOWING EFFECTS OF CONCEALED LIGHTING. (*Mr. Ackerley*).

FIG. 6.—Yet another charming example of concealed lighting, the Chapel at the Royal Hospital, Chelsea.

(*The above introductory contributions, which were circulated prior to the meeting, were supplemented by several others. The Hon. Secretary presented at the meeting a written contribution from Mr. J. Darch, who lectured before the Society on Church Lighting in* 1920; *and also a contribution kindly furnished by Mr. H. Passmore, a member of the firm of architects to whom the Society's invitation to the meeting, addressed to the Ecclesiastical Commissioners, had been conveyed. A contribution dealing with the lighting of a number of churches by gas was also made by Mr. F. J. Gould. These three items are summarized in what follows. We propose to deal with the remainder of the discussion in our next issue.*—ED.)

Some General Comments on Church Lighting

Mr. H. PASSMORE (*communicated*):—

The subject of the artificial lighting of a building is one of the utmost importance from the architect's point of view for two reasons. In the first place, it should be so illuminated that the persons using it may do so with comfort, and, in the second place, the lighting should be so arranged that the building may be seen to the best advantage.

In dealing with the matter I propose to confine my remarks to electric lighting. Even so, it is impossible to lay down any hard and fast rules as to the method to be employed for the lighting of a church, as each case must be dealt with on its merits, but the following are certain general principles which should, to my mind, be observed:—

(1) The lighting should be sufficient, without being overdone, and theatrical effects should be avoided. There is a tendency, I think, for electrical engineers, if uncontrolled, to provide too much light. This impairs the restfulness of the building and destroys any sense of mystery it may possess.

(2) Where possible, the lighting points should be so arranged as not to cause glare in the eyes of the worshippers. Pendant lights on the central axis of the nave and chancel should never be permitted.

(3) In fixing the positions of points and the runs of the wiring due regard should be given to the architectural features of the building. This is an easy matter in a new building, where arrangements can be made from the outset for the proper concealment of wiring, etc., but in an ancient building the problem is generally a difficult one. The electrician, if left to himself, often appears to be under the

impression that the building was specially designed for the purpose of displaying his switchboard, conduit, junction boxes, and other gadgets of that kind, whereas the best job is, of course, that in which the mechanical means by which the current is conveyed to the various lighting points is least prominent!

Some people favour concealed floodlighting: others prefer a system in which the units supplying the light are visible. I am inclined to think that a combination of the two methods is, perhaps, the most satisfactory solution. This is the method employed at Southwell Cathedral, St. David's Cathedral, and other churches that have been lighted under our supervision.

In these instances the visible lights are in the form of small lanterns suspended on the east side of the arcade piers from simple wrought-iron brackets fixed on the top of the caps of the piers. Being on the east side of the piers, these lanterns do not catch the eye of worshippers facing in an easterly direction. In addition to these points, floodlights are provided in the triforium, arranged at various angles so as to distribute a generally diffused light over the whole building.

Where there is no triforium gallery, floodlights can be fixed in the western jambs of clerestory windows, if such windows exist, or on the eastern side of roof principals.

Floodlighting is particularly applicable to the chancel, as visible pendant or bracket lights, if of sufficient power to give adequate light to the choir, are open to the objection that they cause a glare in the eyes of the congregation. At the extreme eastern end of the church a restful effect can be obtained by the use of lamps of a slightly flame-coloured tone in the floodlight fittings.

Where there are no caps to the arcade piers, or if there is difficulty in concealing the wiring carried down to the springing level of the arches, the pendant lights are, in my opinion, best suspended from the top of the aisle roof immediately behind the arches. They should not be hung from the arches themselves.

The main switch should be placed in such a position that it can be conveniently turned off by the verger when leaving the church, and a pilot light, protected by its own fuse, and with a local switch at the door, should be provided so that he may not have to grope his way out in the dark.

A dimmer to enable the whole of the lights to be lowered during the sermon is a useful adjunct to the installation if it can be afforded. This, in my opinion, gives a better result than switching off certain lights and leaving others on.

In addressing such an audience it is unnecessary perhaps to emphasize the fact that workmanship should be of the best possible character. The rules of the Institution of Electrical Engineers and of the fire insurance companies, being of a general nature applicable to all classes of property, naturally permit methods that should not be allowed in buildings of historic interest which are open to the public.

It is particularly true of electrical installations that cheap work is far from economical in the long run.

Where possible, all wiring should be enclosed in heavy-gauge, solid-drawn, enamelled screwed conduit. In an old building, where all wiring must, as a general rule, be carried on the surface, lead-sheathed or cab-tyre wiring may be permitted in certain places, as it is more easily concealed than steel conduit, but it must be borne in mind that lead sheathing is subject to damage by rats and mice, and it should never be run in contact with oak or limestone, or in places where walls are liable to damp (i.e., below valley gutters). It is essential, therefore, that all wiring in the roof space, above the ceiling, should be enclosed in conduit, and special spacing saddles should be used to keep lead-sheathed wiring clear of oak, limestone, or walls liable to damp, in order to avoid chemical action being set up.

For plugging walls, plugs of the familiar special patterns should be used (not wood plugs), and all screws should be of brass. Where it is necessary for wiring to pass through a wall or pier a length of small-bore piping, preferably of stoneware or terra-cotta, should be introduced.

No wiring should be carried over the face of mouldings or carving, and no timber should be pierced if it can be avoided. If no other course is practicable, the hole should be of the smallest possible size, and, in the case of structural timbers, it should be drilled through the centre of the beam.

If possible, overhead wires running through the churchyard from the supply company's main should be avoided, and where the company's cable is brought inside the building it should be as short as possible, and run on solid brick or stonework out of reach of persons using the church.

Finally, I would emphasize the point that those who are responsible for the upkeep of our churches, particularly those of historic or architectural interest, should entrust electrical work only to conscientious firms of high standing.

Mr. JOHN DARCH, in a contribution illustrated by numerous lantern slides, remarked that the lighting of cathedrals and small churches alike should be governed by the true principles of lighting. The best and most effective methods are not necessarily the most costly. Charming effects resembling that of daylight may be obtained from a few of the higher power (and more efficient) lamps set in simple reflectors which, with properly arranged organ and pulpit lighting and perhaps a few concealed lamps, will complete the illumination of the interior.

Methods of lighting, Mr. Darch suggested, are too often even to-day concerned to show *themselves* rather than modestly to exhibit the building and its contents! Even more objectionable are gorgeous chandeliers with a multitude of lights, costly and obstructive and irritating to the eye. As an instance of possible economies Mr. Darch mentions a non-conformist church in which the simplicity of method proposed by him enabled an original estimate of £146 to be reduced to £88. He endeavoured to imitate good daylight conditions, paying careful attention to the positions of lamps, usually of from 200 to 500 watts, but occasionally up to 1,500. On the ground of economy direct lighting was usually preferable to indirect, units being placed high up, and so situated that neither the sources nor the insides of the carefully selected reflectors are ordinarily visible.

Mr. Darch had assembled a series of lantern slides to illustrate these points, and a number of these were shown at the meeting. Views were exhibited contrasting the old method, characterized by sources exposed at a low level, with the new concealed and direct lighting in a church in West Kensington. The arrangement afforded 3½ foot-candles of general illumination and 5 foot-candles in the chancel; during the sermon the general illumination could be reduced to 0.75 foot-candle. Another good example of direct lighting was afforded by a church at Dulwich, and instances of churches illuminated by gas, by arc lamps, and by indirect means were mentioned.

Several slides related to pulpit lighting; two sources completely screened from the congregation and situated on either side of the preacher being shown in one instance, and lighting units recessed into the canopy above the pulpit in another instance.

Mr. F. J. GOULD: We all approach our various lighting problems from different points of view, but with church and cathedral lighting we should, as a body, have unanimity of opinion. There are, of course, exceptions amongst the younger generation of lighting enthusiasts, advocating what I term theatrical effects, such as powerful spot-lighting, etc., but I think that the "atmosphere" of these places of worship demands from us a sympathetic approach. Apparently opinions vary both from a point of view of the method of lighting and to the degree of illumination suitable.

There appears in the current number of *The Illuminating Engineer* an article on the lighting of Ripon Cathedral. There is shown a photographic reproduction of the nave at night (presumably lighted by candles); the gloom is appalling, and one can fully appreciate the fervour with which the evening congregation at the cathedral repeated "Lighten our darkness, we beseech Thee, O Lord!" Now, apparently, the prayer has been answered. There is another photographic reproduction of the nave showing a daylight effect. It is quite possible, of course that both photographs have been exaggerated, but the lighting now is said to be so effective that it enables the congregation to study the beauties of the noble Gothic architecture. Mr. Howard Robertson, however, suggested that distraction is obviously not desirable, and I agree.

Whatever the source of light, such an effect to my mind would be unsuitable. Whilst avoiding that "dim religious light," one aims rather at a uniform illumination of from 2 to 3 foot-candles for nave and side aisles, and, say, 3 to 4 foot-candles in the chancel. Some architects will ask for less illumination values; what would be the effect of 6 to 10 foot-candle illumination, say, in Westminster Abbey, St. Paul's Cathedral, or Westminster Cathedral?

In my home city of Bath there is a beautiful abbey church originally founded as a nunnery by Osric, 676 A.D., refounded as a College of Secular Canons by Offa, 775 A.D. John de Villula bought it, and made it the see of the bishopric instead of Wells in 1090 A.D. After the great despoliation in Henry VIII's time, the abbey fell on evil days, but in the 19th century it was thoroughly restored under the direction of Sir Gilbert Scott. It is described by Fuller as being "most spacious and specious, the most lightsome as ever I beheld"—it is known as the "lantern of the West" because of the number and size of its stained-glass windows. The great walls are crowded with monumental tablets; many of England's famous men are buried there.

Some would say, perhaps, that it requires illuminating by 200-candle-power floodlights, but the majority of you, I am sure, with true æsthetic sense, would prefer to leave it as it is. The nave is illuminated by the old coronæ pendants converted with inverted gas burners. These are suspended from wrought-iron scroll brackets fixed immediately above and projecting from the apex of the great Gothic arches, lighting both nave and side aisles, and these are not unsightly either by day or night. These shaded light-sources contribute a soft and pleasant light of not more than 1½ foot-candle illumination, and both the fittings and illumination are in keeping with the abbey. I am sure that neither James Quin nor Beau Nash, whose bones lie there, could find any words other than those of commendation. As Mr. Wheat truly says, "the type of service has a distinct bearing on the lighting that is acceptable," and I would add, also, architectural form.

Suggestions have been made to the abbey authorities to change their light-source, but apart from the soft diffusion of light, they find great comfort in this vast church from the heat values, and this is a point that should not be overlooked. In several churches where a cold light has been installed, it has been found necessary to renew several lighting positions with gas to overcome the complaints of cold downdraught. In one case, it was found necessary to instal 40 ft. above the floor-level shielded gas clusters of 1,000 candle-power each, which successfully prevented the cold downdraught. There is a word to be said in favour of gas lighting from a point of view of ventilation. In all ecclesiastical buildings, where you have large congregations, a gas installation reveals ventilating properties which are distinctly valuable. By creating a constant air movement one does prevent stuffiness.

(At the conclusion of his address Mr. Gould exhibited a series of lantern slides illustrating the lighting by gas of churches in Addiscombe, Croydon, Carshalton and Manchester.)

Correspondence

THE SPREAD OF LIGHT-BEAMS AND THE MEASUREMENT OF BEAM-FLUX.

SIR,—In the article "Some Remarks on the Spread of Light-beams and the Measurement of Beam-flux," which appeared in the November issue (p. 24) of your journal, the authors, Messrs. Bergmans and Keitz, referred to the code issued by the D.B.G. for the rating of projectors. They criticized it, taking particular exception against the distinction between the spread for "short-distance" and "long-distance" work. In the D.B.G. Code for long-distance work the spread is defined as the angle within which the light intensity exceeds 50 per cent. of the maximum; for short-distance work it is the angle within which the intensity is not smaller than 10 per cent. of the maximum.

Professor Gehlhoff, the former President of the D.B.G. Commission on Projectors, unfortunately died recently, and inasmuch as I was instrumental in drawing up the code jointly with him I would like to take up herein the objections raised by you.

The D.B.G. Code was prepared at the time for such projectors in which the concentration (ratio of maximum to mean spherical intensity) reached about the dimensions customary for automobile searchlights. Floodlight projectors, which since have been adopted on a large scale and which have mainly been used by Messrs. Bergmans and Keitz in their experiments were then out of consideration. As far as projectors for long-distance work was concerned, the chief items at issue were beacons and projectors for marine and military purposes, while for short-distance work especially automobile searchlights came into account. Since the time of 1924, when the D.B.G. Code was published, other lighting appliances have appeared, particularly floodlights to which the rating of the code may be employed accordingly. Which spread is to be chosen here, whether the one for 50 per cent. or that for 10 per cent. of maximum candle-power, this may best be decided in each individual case. In this respect one may agree with Messrs. Bergmans and Keitz, that in a new edition of the code the distinction between projectors for long- and for short-distance work may be dropped in connection with the beam-spread. It might be well, though, to state both the spread for 50 per cent. as well as for 10 per cent. in all cases where a particular beam-spread is not asked for. On the other hand, it does not appear advisable to give a third spread of 25 per cent. of maximum intensity, as this would cause confusion. Moreover, its value will differ very little from the mean of the two others.

Berlin. (DR.) L. BLOCH.

The Annual Dinner of the Illuminating Engineering Society

(Held at the Trocadero Restaurant, Piccadilly Circus, London, W.C., at 7-30 p.m., on Tuesday, February 9th, 1932).

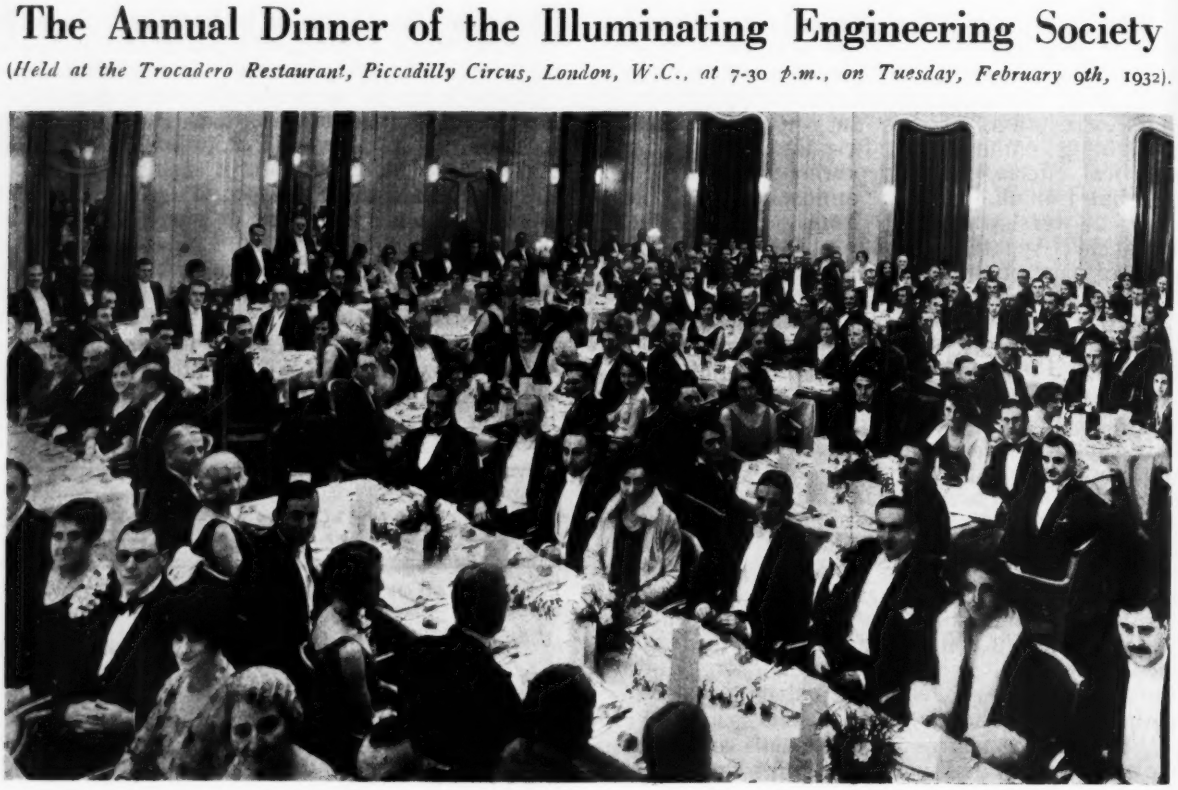


Photo by Rawood Ltd.

This successful photograph was taken without the aid of flashlight during the dinner. In the background the President (Sir Francis Goodenough) is seen standing with the Minister of Transport (Mr. P. J. Pybus) on his right. Further to the right are Lady Goodenough, Sir Cyril W. Hurcomb, Lt.-Col. A. P. Heneage and Mr. J. H. Canning; on the President's left will be seen Lady Hurcomb, Capt. J. M. Donaldson, Sir John and Lady Brooke, Mr. Sydney Tatchell, and others.

THE annual dinner of the Illuminating Engineering Society, held on Tuesday, February 9th (exactly the anniversary of its foundation), at the Trocadero Restaurant, Piccadilly Circus, proved once more a pleasant and successful affair.

The numbers present (209, according to the table plan) was once more a record, the 200-mark being passed for the first time in the history of the Society (surely a gratifying indication of its vigour in this year of industrial depression!). Members were particularly pleased to see that the President (Sir Francis Goodenough) had quite recovered from his trying illness and was present, with Lady Goodenough, to welcome the guests. The party was of a varied character, both gas and electric lighting being well represented. Amongst those present may be mentioned: Sir John Brooke, C.B. (Deputy Chairman to the Electricity Commission) and Lady Brooke, Mr. G. Campbell and Mrs. Campbell, Mr. J. Herbert Canning (President of the Institution of Gas Engineers) and Mrs. Canning, Mr. J. F. Colquhoun (Past President of the Association of Public Lighting Engineers), Mr. A. C. Cramb (Director of the British Electrical Development Association) and Mrs. Cramb, Capt. J. M. Donaldson, M.C. (President of the Institution of Electrical Engineers), Mr. J. S. Dow (Hon. Secretary), Miss Dow and Mrs. M. F. Dow, Dr. S. English, and Mrs. English, Col. C. H. Silvester Evans, Mr. J. Y. Fletcher, Mr. P. Good, Lieut.-Col. Haydn T. Harrison (Vice-President), Miss C. Haslett, Lt.-Col. A. P. Heneage, M.P., D.S.O. (Parliamentary Private Secretary to the Minister of Transport), Sir Cyril W. Hurcomb, K.B.E., C.B. (Permanent Secretary of the Ministry of Transport) and Lady Hurcomb, Mr. W. J. Jones, Major Geoffrey H. Kitson (President of the British Commercial Gas Association), Mr. Stephen Lacey, Brigadier-General R. F. Legge, Mr. H. A. Lingard and Mrs. L. Lingard, Sir John H. Parsons, C.B.E., F.R.S., Mr. C. C. Paterson, O.B.E., and Mrs. Paterson, Mr. F. W. Purse and Mrs. Purse, Mr. P. J. Pybus, C.B.E., M.P. (The Minister of Transport), Mr. W. R. Rawlings and Mrs. Rawlings, Mr. W. J. Sandeman, Mr. C. W. Sully (Vice-President), Mr. Sydney Tatchell (Vice-President of the Royal Institute of British Architects) and Miss Tatchell, Mr. H. Hepworth Thompson (Vice-President) and Mrs. Thompson, Mr. J. L. J. Veit and Mrs. Veit, and Mr. H. T. Young.

Amongst the few who were unfortunate in being prevented at the last minute from attendance, owing to indisposition, were Lt.-Col. Kenelm Edgcumbe and Mr. D. R. Wilson. A telegram was also received from Dr. N. A. Halbertsma (Holland) expressing regret at inability to attend and conveying wishes for a successful evening.

The usual loyal toast having been honoured, the toast of "The Illuminating Engineering Society" was proposed by the Minister of Transport, Mr. P. J. Pybus, C.B.E., M.P.

"The Illuminating Engineering Society."

Mr. P. J. Pybus (*The Minister of Transport*) in his opening remarks congratulated the Society on having as its President Sir Francis Goodenough, with whom he (Mr. Pybus) had been associated on the National Committee on Education in Salesmanship. It had been an inspiration to witness the vigour and enthusiasm of Sir Francis, and he was pleased to observe that one result of this work would be the holding of a great international conference in the near future.

Mr. Pybus added that he was very glad, both as an engineer and as Minister of Transport, to be present, and to have the honour of proposing the toast of The Illuminating Engineering Society. The establishment of a body for the express purpose of treating illumination scientifically and artistically

had been far too long delayed. There was evident need for the skill of the illuminating engineer in making use of the powerful sources of light now available. He recalled that he was at one time concerned with the supply of electricity in the town of Omdurman. In order to encourage the consumers to take the supply quickly, a young engineer with some training in the science of illumination was appointed to take charge. For weeks and months the load scarcely grew at all. Then suddenly bazaar after bazaar in the native quarters blazed with light. The increase in the load was followed by a stream of requests for larger and larger lamps—the demand for brighter and better lamps was fast and furious—and when he last saw Omdurman each bazaar was equipped with one lamp of enormous wattage.

Mr. Pybus proceeded:—

"What an enormous amount of education the consumer at home has needed and still needs! what glorious missionary work you have performed! and what a heart-breaking job it must have been to achieve the improvement in illumination which has so lately been evident in London and our large cities. A short time back I can remember that it pained a man to be told the best way to test the lighting in his room was to turn his back on the light, and he would often ask the good of buying a light and turning his back on it!"

He thought that the recorded increase in consumption, both in gas and in electricity, furnished clear proof that this work had not been in vain and that it had produced an adequate return. The increase in both fields had been remarkable. In many big centres the fortunate consumer of to-day was able to choose whichever form of illumination he preferred; in short, he paid his money and he took his choice.

In conclusion, Mr. Pybus paid a tribute to the enterprise shown by the illuminating engineers in the organization of the magnificent displays of floodlighting that had given so much pleasure a few months ago. Their cessation only emphasized their success. What wonderful but formerly hidden beauties in our monuments and public buildings had this ingenuity revealed! He could not help feeling that the architects of a century ago, struggling to achieve the artistic effect of shadow in a country where there is too little sun, would have rejoiced to see the beauty created by the floodlights.

As Minister of Transport it was also of interest to him to note the progress that had been made in recent years in applying floodlighting to the railway marshalling and sorting yards. These developments were beneficial both in expediting operation and in increasing the safety of the men employed.

Sir Francis Goodenough, C.B.E. (*President*), responding, expressed his appreciation of the kind reference that Mr. Pybus had made to himself and to the work of the Society. It was a gratification to him to witness this steady growth of the Society. He felt that he should make some apology for his somewhat tardy appearance as President; members were aware that this was not due to lack of interest, but to the fact that he had first been abroad and subsequently abed, and was only recently well enough to take up his duties.

He thought the Society was to be congratulated on the excellent attendance at the dinner, which he understood was a record. This must, he felt, be gratifying to their Hon. Secretary, Mr. J. S. Dow, to whom the Society owed so much, and to his staff, Miss Moreton and Miss Wright—especially the former, whose special province it was to look after the annual dinner.

The International Illumination Congress, to which Mr. Pybus had alluded, had undoubtedly done much to foster interest in the Society. He would like to take this opportunity of mentioning by name a few of those who had worked so hard to make the Congress a success. He would like to congratulate Mr. C. C. Paterson on the able way in which he had presided over the Congress, and to make acknowledgment of the excellent work of Mrs. Paterson on the Ladies' Committee; to thank Mr. C. W. Sully and Mr. Percy Good, who presided respectively over the Programme and London Committees, and who had both done an immense amount of work. All those he had mentioned were present, but he wished to mention also the services of the Chairman of the General Council, Lt.-Col. K. Edgcumbe, who was unfortunately unable to attend. He had one other special announcement to make in this connection. Everyone must have recognized the amazing amount of work undertaken, always cheerfully and efficiently, by the Honorary General Secretary of the Congress, Col. C. H. Silvester Evans. Those associated with the Congress had already given expression to their appreciation of this wonderful work. But the Council of the Illuminating Engineering Society had felt that they should also recognize these services, and it had accordingly been decided to elect Col. Evans a life member of the Society, without payment of subscription.

On such occasions one liked to feel that the illuminating engineering societies in other countries were making progress. He had just recently sent a telegram of congratulation to Mr. Julius Daniels, the President of the Illuminating Engineering Society in the United States, which had attained a "silver wedding," and would celebrate its twenty-sixth annual convention in the course of the present year.

In conclusion, Sir Francis again thanked Mr. Pybus for his address. He was very glad that he had been able to attend; it was likewise a pleasure to see amongst their friends that evening Sir Cyril Hurcomb, Sir John Brooke, and the Presidents of the Institutions of Gas and Electrical Engineers and of the British Commercial Gas Association.

"The Guests."

Mr. C. W. Sully (*Vice-President*) said that it was his pleasant duty to draw attention to the presence of the number of visitors who were sharing in this festive occasion. The pleasure of such a gathering was naturally associated with the brightness around, in the form of "lumens" which those present had last year been invited to estimate. But this pleasure was likewise dependent upon the "luminaries" in their midst, the enlighteners whose prominence over the lumens was that of a mountain to the lake at its foot! Amongst those responsible for this social radiance we wished to mention firstly the Minister of Transport, whose presence that evening was so much appreciated, Sir John Brooke, the Deputy Chairman of the Electricity Commission, and Mr. Herbert Canning, President of the Institution of Gas Engineers; also Mr. J. F. Colquhoun, Past President of the Association of Public Lighting Engineers, an Association which, although young, had work of the utmost importance before it. There were many others, including those associated with different systems of lighting, whom he also desired to welcome. They were all ready to join hands and share in the endeavour to bring about better lighting conditions. He hoped that some of them would be present again next year, not as guests, but as members of the Society.

He wished to associate specially with the toast two names. The first name was that of Captain

Donaldson, the President of the Institution of Electrical Engineers, who was well known to-day as one of the most active thinkers and successful organizers in the industry. The second name was that of Mr. Sydney Tatchell, a Vice-President of the Royal Institute of British Architects, who represented the members of his noble profession—happily growing in numbers every day—who realized the importance of forethought in order to ensure adequate internal and external illumination of their designs.

Captain J. M. DONALDSON, M.C. (*President of the Institution of Electrical Engineers*), briefly expressed his pleasure in being present at this gathering. He recalled his past experiences in connection with floodlighting, for which he had long been an enthusiast. He recalled that his company had offered to floodlight a number of war memorials immediately after the war free of cost; in several cases the offer had been refused. It was evident that much educational effort was necessary in order to get people to appreciate the possibilities of artificial light, but the wonderful display of floodlighting during the Congress must surely have a far-reaching influence. Personally he thought that the floodlighting of Edinburgh Castle was one of the finest efforts. Captain Donaldson concluded by again expressing his thanks for the hospitality of the Society and his wishes for its future prosperity.

Mr. SYDNEY TATCHELL (*Vice-President of the Royal Institute of British Architects*), who also desired to express the thanks of all the guests, congratulated the Society on its able and distinguished President—and Sir Francis on being President of such a flourishing Society. He himself, as Mr. Sully had remarked, represented the profession whose function it was to design buildings in order that they might be illuminated! The question of floodlighting was now exciting general interest, and there were a number of problems still awaiting solution. For instance, most buildings were designed with a view to receiving illumination by light coming from above, whereas floodlights were usually so installed as to cast upward shadows. It would seem, therefore, that we should either have to stand on our heads or revise our system of illumination! Mr. Tatchell concluded by again expressing thanks to the Society.

In accordance with the tradition of the Society, these speeches terminated at an early hour, after which members retired to the assembly room whilst the dining-room was being prepared for dancing. It was again a fascinating spectacle to visitors to witness the dividing wall sinking into the floor below (carrying with it the lights still in action). The novel lighting of the Empire Room, though familiar to most of those present, owing to their experiences at the Trocadero a year ago, was again much admired.

Dancing continued until 12 p.m., when the party broke up with the feeling that the evening had been quite as enjoyable as any during past years.

Public Lighting in Relation to Safety

IT has been decided that at the annual conference of the National "Safety First" Association, which will be held in London during May 4th-7th, a session will be devoted to a discussion on "Street and Public Lighting in Relation to Safety." The Association of Public Lighting Engineers has been asked to co-operate and to furnish an introductory paper on the subject.

It is proposed to prepare this in the same manner as was adopted with the paper presented before the Public Works, Roads and Transport Congress in November last—namely, by assembling information and ideas submitted by various members of the Association. The Hon. Secretary (Mr. J. S. Dow, 32, Victoria Street, London, S.W.1) would be glad to receive from members, *not later than March 15th*, any useful data bearing on the matters below. This information may be either statistical (e.g., numerical data showing how the number of accidents has been reduced by better lighting) or illustrative (e.g., suggesting certain arrangements of lights or signals which are desirable in the interests of public safety and convenience). It will be observed that whilst the main object of the paper is to demonstrate the value of good lighting in the interests of safety an effort will also be made to show how the provision of satisfactory public lighting is really a measure of economy, seeing that it prevents waste of effort, facilitating rapid passage of traffic or speedy transaction of business, and may also serve to improve the rateable value of certain areas.

The meeting has been provisionally arranged for the morning of *May 5th*, and Mr. Harold Davies (Vice-President), of Chesterfield, has kindly undertaken to present the introductory paper.

The following list of topics is not intended to be exhaustive, and the Hon. Secretary would welcome any other data illustrating the value of public lighting in the interests of safety, public convenience and economy. Information would, however, be particularly acceptable on the following points:—

(1) The value of public lighting in (*a*) preventing accidents, (*b*) assisting the police in the guidance of traffic and the preservation of order, (*c*) improving trade or enhancing the rateable value of property, and (*d*) contributing generally to social welfare and intercourse.

(2) The utility of luminous traffic signals and illuminated information or warning signs in (*a*) diminishing accidents, (*b*) enabling traffic to be handled more easily, and relieving congestion.

(3) The importance of good lighting for arterial and by-pass roads (*a*) in relation to safety, (*b*) enabling them to be more fully used by motorists, and (*c*) in encouraging the diversions of traffic to by-pass roads, and thus relieving congestion in main thoroughfares.

(4) Any methods of installing public lamps or luminous traffic signal devices which are liable to prove definitely detrimental to safety or public convenience and should be avoided (e.g., lamps giving rise to glare; abrupt contrasts in brightness, or positions of light liable to mislead motorists in a fog, etc.

(5) Any notes on recent regulations regarding the extinction of powerful headlights in adequately lighted thoroughfares—and the possibility of a standard of illumination for streets in which no headlights are allowed.

(6) Any suggestions in regard to improvements in public lighting or the lights for traffic-control devices, or warning signs and notices, which could be used with advantage at the present time.

Literature on Lighting

(Abstracts of recent articles on Illumination and Photometry in the Technical Press)

(*Continued from Page* 50, *February*, 1932).

Abstracts are classified under the following headings: I, Radiation and General Physics; II, Photometry; III, Sources of Light; IV, Lighting Equipment; V, Applications of Light; VI, Miscellaneous. The following, whose initials appear under the items for which they were responsible, have already assisted in the compilation of abstracts: Miss E. S. Barclay-Smith, Mr. W. Barnett, Mr. S. S. Beggs, Mr. F. J. C. Brookes, Mr. H. Buckley, Mr. H. M. Cotteril, Mr. J. S. Dow, Dr. S. English, Dr. T. H. Harrison, Mr. C. A. Morton, Mr. G. S. Robinson, Mr. W. C. M. Whittle and Mr. G. H. Wilson. Abstracts cover the month preceding the date of publication. When desired by readers we will gladly endeavour to obtain copies of journals containing any articles abstracted and will supply them at cost.—ED.

II.—PHOTOMETRY.

44. An Automatic Illuminometer. H. Alterthum and R. Rompe.

Das Licht, 1, *p.* 1, 1932.

The apparatus consists of a gasfilled caesium photo-electric cell coupled through an amplifying valve to a milli-amp. meter. The anode voltages were controlled by a potentiometer arrangement. The deflection of the milli-amp. meter produced by the amplified photo-electric current was read by projection on to a transparent scale. In the standard arrangement, the range of the instrument was only up to about 12 lux, but for higher illumination-intensities the anode voltages on the cell and valve could be reduced and a differently calibrated scale employed. Reference is made to difficulties arising from the use of a photo-electric cell with a rising sensitivity on passing from the yellow-green region of the visible spectrum to the infra-red. S. E.

45. On the Calibration of the Sperrschicht Cell for Objective Photometry especially and a Simple Method of Amplifying its photo-current. A. Dresler.

Licht u. Lampe, *p.* 35, *Feb.* 4*th*, 1932.

A discussion of the advantages of using the "sperrschicht" cell in photometry. The choice of the cell with regard to its spectra intensity, its general sensitivity to light, the influence of the temperature of the cell on the photo-electric current, the constancy of the cell with long-continued illumination and other characteristics are discussed and the results of experiments given. Finally, a method of amplifying photo-electric current is suggested, and experimental details are given. E. S. B-S.

46. Photometry with Photo - electric Cells. H. Bertling.

Das Licht, 14, *p.* 359, 1931; 15, *p.* 385, 1932.

A description of various types of photo-electric cells, together with curves showing their relative sensitivities in various parts of the spectrum—visible and invisible. S. E.

47. The Choice of Distance in Measurements of Projectors. L. Bloch.

Licht u. Lampe, *p.* 5, *Jan.* 7*th*, 1932.

An investigation into the deviation of projectors from known laws with regard to variation of surface brightness with distance from the source and the influence of such variation on the choice of distance at which measurements are made. E.S. B-S.

48. On the Applications of Fluorescence to Photometric Measurements in the Ultra-Violet. A. Chevallier and P. Dubouloz.

Comptes Rendus, 194, *pp.* 174-176, *Jan.* 11*th*, 1932.

The authors find that under careful regulation a fluorescent medium applied to a photo-electric cell may be used to measure the intensity of ultra-violet radiation. Several factors require consideration, and the adjustment of the apparatus needs care, but good results can be obtained. S. S. B.

III.—SOURCES OF LIGHT.

49. Light-sources for Talking Film Recording. H. Ewest.

Zeits. f. techn. Physik., 12, *pp.* 645-7, *Dec.*, 1931.

Describes known forms of discharge and tungsten arc lamps suitable for this work, and also a new form of high-current density discharge lamp. G. H. W.

50. The Characteristics of Some Miniature Lamps. W. E. Forsythe and E. M. Watson.

Gen. El. Rev., 34, *pp.* 734-5, *Dec.*, 1931.

Tabular data relating to the temperatures, candle-power and efficiency of automobile, flashlight, and some special miniature lamps are presented. G. H. W.

51. Measurements of Light from Neon Tubes. W. Arndt.

Licht u. Lampe, *p.* 19, *Jan.* 21*st*, 1932.

The article gives the results of comprehensive measurements of neon tubes. Candle-power per cm. length of tube is related to current for various diameters of tube with a gas pressure of 7 mm; also to varying pressure with constant diameter. From these two graphs a curve giving the dependence of candle-power on gas pressure is constructed. This applies for any neon tube of the type used. Further curves illustrate the relation of the surface brightness to the current density, and also its distribution with various pressures. E. S. B-S.

IV.—LIGHTING EQUIPMENT.

52. Developments in the Electrical Industry during 1931 : Lighting. J. Liston.

Gen. El. Rev., 35, *pp.* 79-91, *January*, 1932.

Describes various forms of new lamps and lighting fittings developed in America. G. H. W.

53. Fittings for Turbine Room Lighting. H. G. Schiller.

Light, 2, *p.* 30, *Midwinter*, 1932.

Unusually decorative fittings are used to illuminate a turbine room in Ohio. Each fitting houses 500-watt lamps. A uniform illumination of 9 foot-candles is obtained. Photographs are presented. C. A. M.

54. Flashed Opal and Opal Glass. A. Voth.

Licht u. Lampe, *p.* 39, *Feb.* 4*th*, 1932.

A comparison of the respective merits of flashed opal and opal glasses. The opal glass has a somewhat higher efficiency, but the surface brightness is not nearly so uniformly distributed as with the flashed opal glass. Curves are given, with a discussion of their application. E. S. B-S.

55. Shadow Patterns. A. Rogers.

Light, 2, *pp.* 16-17, *Midwinter*, 1932.

A descripton, with illustrations, of an innovation introduced into indirect fittings. Decorative shadows are obtained by fixing above the lamp a perforated metal cone. A fitting 5 ft. in diameter produces a pattern shadow approximately 20 ft. in diameter. C. A. M.

56. The Calculation of Fresnel Lenses. H. Schulz.

Zeits. f. techn. Physik., 12, *pp.* 569-574, 1931.

The first part of this paper gives formulæ and tables for the calculation of the radii of curvature of stepped lenses for given light distributions. The second part deals with formulæ for curved and flat-faced lenses. G. H. W.

57. Lamps and Illumination. H. W. Richardson.

G.E.C. Journal, 3, *pp.* 19-34, *Feb.*, 1932.

In a review of progress, recent features of general lamp development are mentioned in connection with a record of progress in such fields as decorative lighting and airport lighting. C. A. M.

V.—APPLICATIONS OF LIGHT.

58. Technical Aspects of Architectural Lighting. E. W. Beggs and C. S. Woodside.

Am. Illum. Eng. Soc., Trans., 26, *pp.* 1007-1024, *Dec.*, 1931.

Summarizes the important factors governing the performance of architectural lighting equipment. The incandescent lamps available for this purpose are discussed and their characteristics given. Measurements have been made on various diffusing glasses and photographs are given showing the appearance of the glasses with various lamp arrangements. An approximate method of calculating illumination is suggested. G. H. W.

59. Interim Report: Committee on Light in Architecture and Decoration. Anon.

Am. Illum. Eng. Soc., Trans., 26, *p.* 1005, *Dec.*, 1931.

Eight installations are described with photographs. G. H. W.

60. Planning Lighting Installations of the Neon Tube Type. K. Krüger.

Das Licht, 14, *p.* 341, *and* 15, *p.* 369; 1931.

Suitable relationships between the height and breadth of various letters (block and script) and means for increasing the legibility at a distance are discussed. Data concerning the approximate voltage drop and current strength for tubes of various diameters required for planning an installation are set out in tabular form:—

Gass Filling	Tube Diameter	Voltage drop per metre	Current strength in M.A.		
			Blue	Red	White
Neon	8	1,700	20	17	
	10	1,450	25	20	
	12	1,250	35	30	
	17	1,000	45	40	
	22	750	60	55	
	30	600	120	110	
Helium	12	2,300			45
	17	150			70

S. E.

61. Special Lighting Requirements for Particular Purposes. W. Kircher.

Das Licht, 15, *p.* 371, 1931.

The requirements of three special cases are considered: (1) the cutting and polishing of facets on glass, (2) motor repair shops, (3) examination of collars for manufacturing defects. Satisfactory lighting in the first case was obtained by replacing the ordinary shallow reflector by a concentrating one with a deep cut-off. For the motor repair shop shadows were reduced to a minimum by the use of reflectors giving a wide light distribution. Portable local lighting units were necessary for certain repair jobs. In the examination of collars a small batten with three 25-watt lamps producing a soft light of approximately daylight quality was found useful. S. E.

62. Floodlighting that Outlines. J. Y. Fleming.

Light, 2, *pp.* 10-11, *Nov.*, 1931.

An account of the floodlighting at the City Hall, Buffalo. A photograph shows the rather unusual appearance obtained by floodlighting the recessed central tower to a higher level than the surrounding and lower parts of the building. C. A. M.

63. Luminous Architectural Elements. W. M. Potter and P. Meaker.

Am. Illum. Eng. Soc., Trans., 26, *pp.* 1025-1051, *Dec.*, 1931.

Deals with the forms, characteristics and design of luminous architectural elements. Illustrations indicate something of the scope of their application. Properties of pertinent materials are discussed. efficiency and brightness data are given for representative elements, desirable brightness limits are indicated, and design procedures outlined both for elements to look at and for units for illumination purposes. Author, G. H. W.

64. Recommended Foot-candles. M. Luckiesh and F. K. Moss.

Am. Illum. Eng. Soc., Trans., 26, *pp.* 1061-1092. *Dec.*, 1931.

Intensity of illumination, utilized in accordance with the known relationships between lighting and seeing, is the most generally efficacious means at the command of the lighting specialist for assisting vision. Physically, the foot-candle is a definite and measurable unit, visually, or as an aid to seeing, it is a variable psycho-physiological purpose of advancing the scientific use of this factor in lighting recommendations and practice. The science of "lighting for seeing" has made it possible to reveal some of the imperfections of present foot-candle recommendations, and although still in the early stages of development provides a sound if not complete foundation for better standards of lighting. G. H. W.

65. Floodlighitng the Washington Monument. R. W. Cost.

Am. Illum. Eng. Soc., Trans., 26, *pp.* 1099-1100, *Dec.*, 1931.

Details of the lighting installation provided on the Washington Monument with the object of making it observable to the pilots of aircraft. G. H. W.

VI.—MISCELLANEOUS.

66. Light in Relation to Colour. G. Geoghegan.

Brit.J.Photog., Vol. LXXIX, No. 3739, *p.* 2, (*Supplement*).

The author discusses the relationship between the spectral quality of the light used for taking colour photographs and the light used for viewing the transparency. F. J. C. B.

67. The Transformation of the Trichromatic Co-ordinates of a Colour into the Ostwald Coefficients. M. Richter.

Zeits. f. techn. Physik., 12, *pp.* 582-7, 1931.

Develops formulæ and shows the application of the Luther colour stimulus figure. The Ostwald system is criticized. G. H. W.

68. The Construction of Photo-electric Cells with Large Cathode Surfaces. R. Fleischer.

Zeits. f. techn. Physik., 13, *pp.* 92-4, *No.* 2, 1932.

Discusses the ideal geometrical and physical factors in photo-cell design, and gives the performance of a cell large enough to drive a small motor directly when illuminated with sunlight. G. H. W.

69. The Study of the Lag in Gasfilled Photo-electric Cells. P. Fourmarier.

Comptes Rendus, 194, *pp.* 86-89, *Jan. 4th*, 1932.

The ionization by the positive ions plays an important part in the operation of the gasfilled cell, and the slowness of this ionization is probably the main cause of the lag. S. S. B.

The Characteristics of Miniature Lamps

A contribution to the *General Electric Review (U.S.A.)*, by Dr. W. E. Forsythe and E. M. Watson, contains some interesting data on miniature lamps which are produced mainly for use in automobile headlights and torches. The characteristics of such lamps differ materially from those of lamps for standard pressures. The filament is very short, with the result that heat-conduction by the leads lowers the temperature throughout its entire length. In ordinary lamps for standard voltages the loss in efficiency chargeable to these "end-losses" is usually about 3 to 5 per cent., but in miniature lamps it may be as high as 30 per cent. Moreover, in the case of a miniature one is usually content with a relatively short life, because it is so often necessary to get as much light as possible and to work at an exceptional efficiency. The life of flashlight types of lamps varies from 3 to about 75 hours, and that of automobile lamps between 100 and 300 hours. Lamps used in sound-picture work have a life of 25 to 50 hours. Automobile lamps usually are operated on a 6 to 8-volt battery, but many trucks and buses require lamps to operate on 12 to 15 volts. Tables of characteristics were presented by the authors. These show interesting features, the variation in watts per spherical candle-power being very considerable. Excluding one case in each table, we find that the automobile lamps ranged from 0.70 to 1.32 watts per spherical candle, and the flashlight lamps from 0.87 to 1.41. In the two excepted instances quite abnormal values are recorded, namely 2.2 for a certain automobile lamp and 4.10 for one flashlight lamp!

The smallest lamp made is the "Grain-o'-Wheat" surgical lamp, used in connection with internal medical examinations. The bulb of this little lamp is a tube about 2 mm. in diameter and about 8.7 mm. long. The complete lamp weights 0.06 grams and consumes only 0.17 watts, but naturally operates at a high specific consumption, namely, about 6 watts per spherical candle.

New Ideas in Lighting Fittings

Whilst there has recently been manifest a strong tendency to break away from old designs of lighting fittings and embark on entirely new methods ("architectural" lighting), one also finds, especially in important new buildings, a desire to compromise by introducing new ideas in an old setting. This is evident from the description in *Lighting* of the installation in the magnificent new Waldorf-Astoria Hotel, New York. One notices, for example, the use of Adam fixtures in the Jade Ballroom, and of conventional crystal chandeliers in the Basildon Room, stated to be of "modern Adam" design. In both cases, however, the actual lighting equipment is entirely indirect. Indirect lighting is again applied to a series of fittings of polished aluminium and crystals in the ballroom gallery, which produce an impression of flowing water. The use of large Pompeian urns, equipped with lamps and reflectors concealed near the top so as to direct light upwards, is again an instance of an effort to combine the new and the old. Perhaps the most singular of all the methods is the trellis-shaped equipment installed in the Sert Room. This large framework, composed of chromium-plated metal, is supported from the ceiling, and bears a considerable number (apparently about 150) cup-shaped fittings furnishing indirect lighting.

Floodlighting with Gas

[By courtesy of the "Leamington Spa Courier."

A Pleasing View of Leamington Church Tower, floodlighted by gas.

We are indebted to Mr. Ramsden, of the Leamington Priors Gas Co., for the above pleasing view of the tower of Christ Church, Leamington, one of the oldest churches in Leamington, which has recently been floodlighted by gas. We understand that the lighting units comprised four Sugg nine-mantle "Littleton" lamps, mounted at a height of 11 ft., and four Foster & Pullen 12-mantle strip lanterns, distributed amongst the bushes on two sides. In both cases special home-made reflectors were used. The tower stands out especially well when viewed from a distance.

F. Jacopozzi

Monsieur F. Jacopozzi, whose death at the age of only 54 years has recently been announced, had earned international renown for his skilful and artistic lighting effects. Although born in Florence he had lived in France for about thirty years. His clever and realistic luminous signs had long captured the imagination of Parisians and become famous all over the world. During the war he was entrusted with the task of adjusting the lighting of Paris so as to give a minimum of information to hostile aircraft. Subsequently he was engaged, in conjunction with M. Citroen, in floodlighting the Arc de Triomphe, the Place de la Concord, and other spots in Paris, which he did with great success. He was responsible for some fine colour lighting in connection with the recent Colonial Exhibition. It will be recalled that one of his few efforts in London, the wonderful sign erected outside Gamage's West End Store at the end of 1930, proved in a sense too successful: the crowds that collected gave rise to disputes, which led to its enforced extinction.

An Experimental Multi-Range Portable Photo-Electric Illumination Photometer

(Exhibited at Phys. Soc. Exh., Jan., 1932, by the Research Laboratories of The General Electric Co. Ltd. Patent applied for.)
(Communicated.)

With the establishment of photo-electric photometry in the laboratory and factory, a suitable adoption of the photo-electric cell in portable illumination photometers suggests itself as an obvious remedy for the many troubles associated with portable illumination photometers of the visual type.

Following development work in this connection, an experimental portable photo-electric photometer has been constructed which fulfils the necessary requirements. If this apparatus is found satisfactory after prolonged tests under practical conditions it will probably be developed into a form suitable for general use.

The apparatus consists of a wooden cabinet 12 ins. × 10 ins. × 10 ins., containing batteries, milliammeter, foot-candle scale, galvanometer, control switches and a compartment for housing the separate photo-cell unit for convenience in transport when the apparatus is not in use. The photo-cell unit consists of a small metal box cotaining a special photo-cell of a suitable colour sensitivity, constructed so that it obeys cosine law very closely, and has a linear relationship between photo-current and illumination. This is connected to two electrometer type valves (connected in a bridge amplifier circuit) and a series of grid-leak values, and switches of special design, all of which are sealed in the same screened box in order to maintain the high value of grid insulation necessary for the successful operation of the amplifier.

Sections of the grid leaks can be short-circuited by the six plunger-type switches, thereby changing the effective amplification of the photo-electric current and so readily enabling the range of the instrument to be changed. A flexible lead fitted with five-pin plugs is used to connect this unit to the main cabinet containing the rest of the components and controls.

The method of operation is as follows:—

After having switched on the valve filament current and adjusted it to a predetermined value indicated by a red line on the scale of the milliammeter, the galvanometer, which indicates the "out of balance" of the amplifier bridge, is balanced by means of a potentiometer when the photo-cell is dark. The illumination to be measured is then allowed to fall on the photo-cell, thereby throwing the bridge out of balance. The galvanometer is restored to zero by adjusting a calibrated potentiometer which applies a neutralizing potential to the grid of the valve connected to the photo-cell. This potentiometer reading is proportional to the photo-electric current, and therefore the foot-candles in the photo-cell. Consequently the foot-candle value can be obtained by multiplying the potentiometer scale reading by the scale factor. These scale factors are determined when the instrument is initially calibrated.

The use of this amplifying circuit is only made practicable in a portable apparatus by utilizing electrometer type valves, which have a very high grid insulation and only require an anode potential of about 6 volts and a filament current of 0.1 amp. at 1 volt.

This instrument has six scale ranges operated by the plunger switches, and it is possible on the lowest range to measure values of illumination as low as 0.001 foot-candle, so that street-lighting illumination values can readily be measured.

Public Lighting with Gas

We have been favoured with a copy of an address delivered by Mr. J. W. Lofts in November last, under the auspices of the Manchester District Institution of Gas Engineers, in which a number of points of considerable practical interest were raised. The first point, a simple one, related to the familiar square gas lamp, with a twin-bijou swan-neck conversion fitting. The superheater should almost touch the reflector arranged in the roof of the lantern. If the fitting is mounted low down much of the value of the reflector is naturally lost. Mr. Lofts remarked that this twin-bijou fitting, consuming $3\frac{1}{2}$ cubic feet per hour, will give as much light as a universal mantle burning $4\frac{1}{2}$ cubic feet per hour, and although there are two mantles to maintain instead of one the bijou mantle is so much the stronger that the maintenance cost works out less.

There has been much discussion as to whether four mantles in a line or a cluster formation is the better. Actually the answer depends on the form of reflector adopted with the "directional" type (arranged at either end of the series of mantles, near the roof of the lantern and receiving horizontal light) the linear arrangement is best, but with the so-called "multi-ray" (arranged immediately under the mantles in the base of the lantern) mantles assembled on a circular plan answer best.

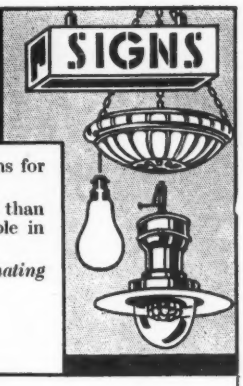
The latter type of reflector is intended to direct light along the kerb line, or with a bias of, say, 15°, and it is made in a three-way type to suit "T" roads and in four-way form for cross roads. (In the original paper polar curves illustrating the effect of such reflectors are presented.) Yet another device is the "pyramid" using four facets of silvered glass, which is mounted at the base of the lantern. Whilst too far from the mantles to have very much influence on the illumination furnished, it has a certain spectacular value.

In the concluding section of the address Mr. Lofts emphasized the reliability of distant-control devices. He agreed that with high-pressure gas lighting 1,000 candle-power can be obtained from a single mantle, whereas with low pressure ten mantles must be used; nevertheless, he contended that the maintenance cost was lower in the case of the low-pressure arrangement.

One somewhat debatable point is the conditions under which central suspension is desirable. It was suggested that in thoroughfares less than 50 feet in width it is almost always preferable to use columns from the side-walks, with bracket-arms projecting 5 ft. or 6 ft. over the roadway to carry the lamps.

In dealing with several queries raised in the discussion, Mr. Lofts doubted the advisability of cup-and-ball joints, mentioning a case in which the force of the wind was sufficient to lift a lamp out of its seating, thus making it necessary to relight the by-pass. Mantles in railway carriages are subject to much vibration, yet such joints are not considered necessary. There was also some discussion on the cost of gas for street lighting (a matter in which public-lighting engineers are keenly interested), and an instructive account was given by Mr. J. Herbert Clegg, of Burnley, of the manner in which reductions in the cost of electricity had led to a drop in the price of gas, and vice versa.

WHERE TO BUY
A DIRECTORY OF LIGHTING EQUIPMENT



We invite applications for spaces in this new section of the journal. Particulars of terms for each space (approx. 1 inch deep and 3½ inches wide) are given below.

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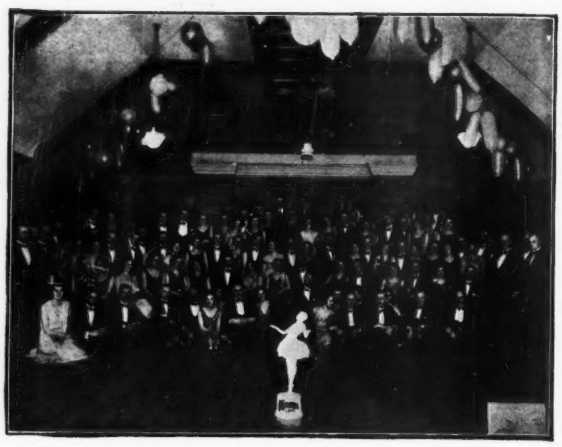
The Proprietor of British Patent No. 268293, dated March 25th, 1926, relating to "AUTOMATIC CUT-OFF VALVE," is desirous of entering into arrangements by way of a licence or otherwise on reasonable terms for the purpose of exploiting the above patent and ensuring its practical working in Great Britain. All enquiries to be addressed to B. SINGER, Steger Building, Chicago, Illinois.

TRADE NOTES & ANNOUNCEMENTS

A Successful Dance

We gather that the annual dance of the B.T.H. Birmingham office staff, on January 29th, to which the accompanying picture refers, was a more than ordinarily successful affair. There were about 130 present—including numerous customers of the firm—and the programme, which included a number of "old favourite" dances, was much enjoyed. An entertaining interlude was the display by Miss F. M. Hughes, one of the younger members of the staff, during which her similarity to the famous "Mazda Girl" excited comment. The band throughout was excellent, and responded generously to the repeated demands for encores.



A View taken during the B.T.H. Birmingham Office Staff Dance.

Laundry Lighting

There can be few lighting problems that the E.L.M.A. Lighting Service Bureau has not dealt with in its illustrated booklets. The eleventh of the series, now before us, deals with laundry lighting. It is printed in somewhat unusual but striking heavy type and contains a number of effective photographs. The value of good lighting in the various departments of a laundry is emphasized, hints on methods of lighting in each case are given, and illustrations of suitable lighting units are included. We notice that the values of illumination recommended range from 5 foot-candles in the dispatching department to 12 foot-candles for ironing and pressing. The value of artificial daylight in the inspection department, where stains and scorches must be zealously sought for, is emphasized. There is no doubt that certainty in this respect is well worth while, even if the wattage of lamps used needs to be approximately 50 per cent. greater. In a final section the value of light for purposes of advertisement is illustrated. (Laundries are not all aware that they need to advertise, but they do!)

Korting & Mathiesen Electrical Ltd. New Works at Parsons Green

Readers will be interested to learn that Messrs. Korting & Mathiesen Electrical Ltd. have now started production in their new "Kandem" Works at No. 10, Parsons Green, London, S.W.6. These new works, when completely equipped, will furnish the firm's numerous lighting fittings and lanterns for street lighting, floodlighting and general interior lighting, and likewise their specialities for the lighting of photographic and film studios and arc lamps for various industrial purposes.

Contract Closed

The following contract is announced:—

SIEMENS ELECTRIC LAMPS & SUPPLIES LTD.:—

British General Post Office; for the supply of several thousand special inspection lamps.

Electrification of a Glasgow Restaurant

From the General Electric Co. Ltd. we receive particulars of the electrification of a new building recently opened in Union Street, Glasgow, by Messrs. R. A. Peacock & Son Ltd., the old-established firm of bakers and confectioners. The whole building, including the kitchens, has been electrically equipped. Apart from the cooking equipment, the lighting by Osram lamps and special G.E.C. fittings presents points of interest. The tea room and restaurant are illuminated by diffusing fittings mounted near the ceiling, and the ballroom is treated in a novel manner by means of luminous cornice lighting. Perhaps the most interesting feature is the lighting of the basement by means of lamps behind panelled laylights fitted flush with the ceiling, which gives a pleasing "sunshine" effect.

"Simplex" Specialities

A folder illustrating new "Simplex" watertight fittings (switches, plug-and-socket fittings, etc.), has recently been issued. Another folder from the same firm deals with the "Black Prince" series of range of switchgear for 15 and 30 amp. circuits.

Stage and Auditorium Colour Lighting

THIS is an age of specialization in catalogues and publicity literature, and a list dealing with the above topic recently put out by Holophane Ltd., has a number of unusual features.

There is firstly a serviceable summary of the requirements of theatre, cinema, cyclorama and concert stages. Applications of Holophane colour-lighting equipment are illustrated by a number of pictures in colour, of which those showing the treatment of curtains are good examples. The adjacent picture (Fig. 1) shows another ingenious application of coloured lights, namely, their use to produce coloured shadows giving rise to varied and curious effects.

FIG. 1.—An ingenious stage effect, the movements of the figures in foreground creating multiple-coloured shadows behind them.

Colour battens, horizon and panorama floods, colour floodlights and spotlights next receive attention, after which we come to what are really among the most intricate and ingenious appliances used in colour lighting, the dimmers and regulators by which these effects are controlled. By means of a motor-driven master dimmer the whole of the auditorium lighting can now be operated from one position.

The final section of the catalogue deals with colour lighting for interiors, and here again new and ingenious ideas are manifest. Luminous troughs, pillars and recessed domes afford fairly familiar objects for colour-treatment; more novel are the "colour-painting" devices, such as the bracket and pendant fittings giving out streams of multi-coloured light and the singular "void-above ceiling" contrast-effects. We cannot reproduce here the coloured plates in the original catalogue, but Fig. 2 illustrates some of these devices in action.

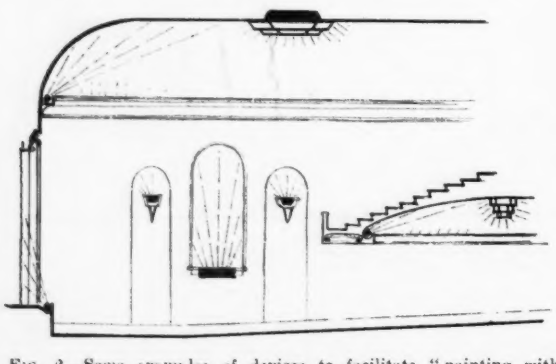


FIG. 2.—Some examples of devices to facilitate "painting with light."

The two final illustrations showing the "atmospheric" effects in the Richmond Theatre and the floodlighting of the exterior of the Savoy Theatre, Brighton, are typical of modern methods.

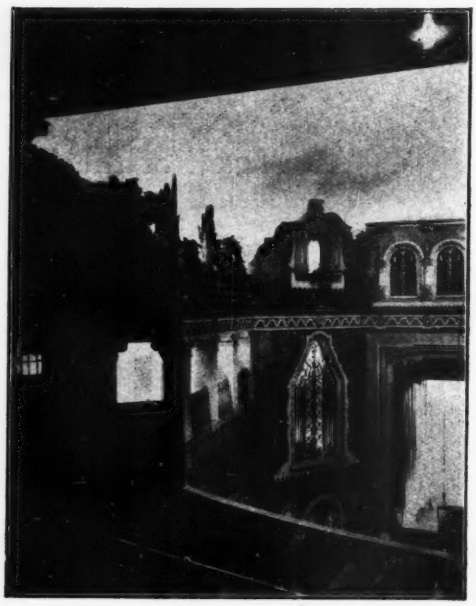


FIG. 3.—Interior lighting of the Richmond Theatre, Richmond, Surrey.

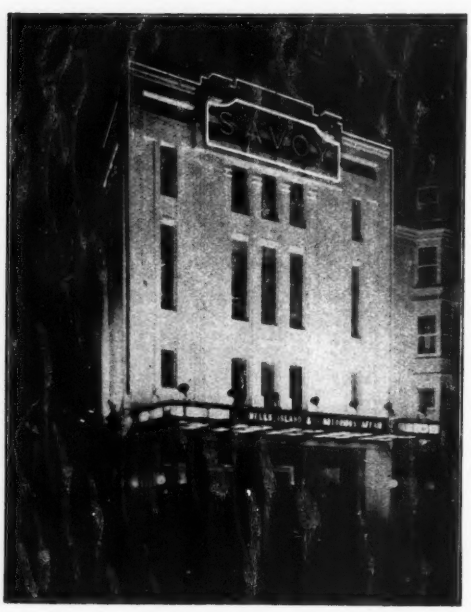


FIG. 4.—Floodlighting of the exterior of the Savoy Cinema, Brighton.

Sheffield Illumination Society

About sixty members and friends of the above Society were present at a lecture held in the Corporation Lighting Department, on the 1st February, in the Isle of Man. This was one of the London Midland and Scottish Railway Company's holiday lectures, illustrated by over a hundred lantern slides. The audience was conducted, in fancy, around the Island, and on excursions from Douglas to Dublin, Glasgow, and other places, and a running commentary was read the while, making a very pleasant evening. Mr. A. C. Burrell, President, presided.